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THE PLANT DISEASE BULLETIN

Issued By

The Plant Disease Survey

SUPPLEMENT 1

Summary of Plant Diseases in the United States
in 1918 -- Diseases of Fruit Crops.

May 15, 1919

BUREAU OF PLANT INDUSTRY

UNITED STATES DEPARTMENT OF AGRICULTURE

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SUMMARY OF PLANT DISEASES IN THE UNITED STATES IN

1918

A summary of the data obtained by the Plant Disease Survey during 1918 will be issued in parts as supplements to the Plant Disease Bulletin as follows:

Supplement I Diseases of fruit crops.

Supplement II Diseases of field and vegetable crops.

Supplement III Diseases of field and vegetable crops (continued).

Supplement IV Diseases of cereal and forage crops.

Supplement V Diseases of fiber crops, forest trees,
ornamental and miscellaneous plants.

The information on which this summary is based was furnished largely by collaborators of the Plant Disease Survey. Many valuable notes were also contributed by field assistants of the Plant Disease Survey, and by other plant pathologists both in the states and in the Department of Agriculture.

For the most part the summary is of 1918 data only, but in the case of some diseases the records of previous years, particularly of 1917, have been utilized, and in certain instances the information from all past survey reports has been abstracted.

PLANT DISEASE SURVEY

1918

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SUMMARY OF PLANT DISEASES IN THE UNITED STATES IN 1918

DISEASES OF FRUIT CROPS

Prepared by

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DISEASES OF POME FRUITS

APPLE

Scab caused by Venturia inaequalis (Cke.) Wint.

Scab was generally less prevalent and destructive in the United States in 1918 than in 1917. It should be remembered however that 1917 stands out rather prominently as a "scab" year along with 1904, 1905, 1908 and 1910, so that in spite of the fact that the disease was relatively less damaging in 1918 than the year preceding, the reports indicate that in the northeast quarter of the country considerable loss was incurred. On the whole, 1918 may be said to have been an average year for apple scab. Apparently the disease was very troublesome in local areas in Missouri and Illinois and was more prevalent than usual in Virginia. It occurred in moderate amounts in the northeast and only to a slight extent in Oregon and Washington. The percentage of the crop injured varies from 1/5 of 1% to 75%, while actual losses range from less than 1% to 10%.

It is the unanimous opinion of collaborators that where scab occurred to a less extent than in 1917, the weather was unfavorable for the fungus. It was relatively dry at the time for primary infections in the spring, except in certain Appalachian and Mississippi Valley states already noted. Later rains however furnished conditions favorable for late infections which occurred rather commonly. Had the weather been more favorable generally for early infections, there would doubtless have been an unusual outbreak.

The earliest recorded appearance of scab is reported from Oregon by J. E. Owens, on April 4. It appeared some two weeks earlier than usual in

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Illinois where H. W. Anderson found abundant infection April 28. Dates of first reports in other states follow:-

April 4.....	Oregon	June.....	Tennessee
April 23.....	Arkansas	June 14.....	Minnesota
April 28.....	Illinois	June 24.....	Connecticut
May 20.....	Pennsylvania	July.....	Vermont
May 24.....	Georgia	July 9.....	New Hampshire

It is of interest to note, for comparison, that the earliest previous date of appearance of scab which has been reported to the Survey Office is April 5, 1905 by A. D. Selby, Ohio.

A composite list of the most susceptible varieties for 1918 includes: Fameuse, McIntosh, Wealthy, Winter Banana, Northern Spy, Ben Davis, Virginia Beauty, Red Astrachan, Yellow Transparent, Early Harvest, Transcendent and Siberian Crab. This list corresponds closely to those of previous years.

Lime-sulfur is still relied on by most apple growers in the United States. Where other diseases occur, like bitter rot, bordeaux is used in late applications. Dusting is reported by states as follows:-

Massachusetts: Limited trials have been made by growers but they are not as enthusiastic over dust as spray. Not used commercially.- Osmon.

New York: Limited tests in Wayne County gave inconclusive results. The cost of dust was considerably greater in one orchard.- Hesler.

New Jersey: Station workers regard the efficiency of dusting as uncertain.- Massey.

Pennsylvania: Dust not a great improvement over check. Bordeaux mixture and lime-sulfur gave excellent control.-Orton.

Delaware: Cost of dusting and spraying about equal. Not efficient for blotch or scab or other minor difficulties.-Manns.

Virginia: "We believe dusting a safe practice for the codling moth application on apple, but would hesitate to recommend it for the control of fungus diseases, particularly for bitter rot and for regions where scab is troublesome."- Fromme.

West Virginia: Dust not very successful. Bordeaux controls scab.- Giddings.

Arkansas: Orchards dusted 4 to 6 times showed about as much scab as those that were untreated.- J. W. Roberts.

Illinois: In general, dust, as used by growers and by station men in experiments, is not as satisfactory as the regular spray for the control of scab but may be used on all except the most susceptible varieties. Dust was successful, however, in the control of codling moth. Dusting is out of the question in the southern part of the state where blotch is prevalent.- H.W.Anderson.

Michigan: Dusting inconclusive, checks clean.- Coons.

Wisconsin: Dust reduced scab 50%, while liquid reduced it 80%. Dust can be more rapidly applied than liquid, but since dust is not as efficient as liquid for the control of scab, there is need of more experimental work to be done before we feel that we can give it our endorsement.- Vaughan.

Minnesota: Dust promising. - Stakman.

Washington: Dusting not used experimentally by the Station. Growers claim that sulfur dust is as satisfactory in the control of apple powdery mildew as liquid spray in the Yakima Valley. - Heald.

Oregon: On account of the unusually dry season scab was very inconspicuous and there was no opportunity for spraying. Codling moth not as well controlled by dust as by spray, although dust produced fairly good results. Dusting more expensive than spraying but this is somewhat compensated for by a saving in time and wages. Spraying is required for dormant applications which are necessary for certain insects and diseases in Oregon. The spray-gun nozzle is coming into great favor, particularly in the Hood River Valley. In this valley wind interferes with dust operations. - Barss.

Dry lime-sulfur, as put out by the Sherwin-Williams Company, was reported as follows:

Maine: In 1916 dry lime-sulfur was slightly less efficient in scab control than were dilutions of home-made, liquid concentrates. In 1917 however the dry material was plainly more efficient. It produced more fruit, russetting in 1917 but the previous year it gave less. The percentage of merchantable apples were in favor of the dry lime-sulfur both seasons. - Morse (In Maine Agr. Exp. Sta. Bul. 271: 125, 1918)

New York: Tests made in 1918 indicate that dry lime-sulfur, if used at double the strength recommended on the label, is about as effective as commercial lime-sulfur solution for apple scab. - Hesler

Wisconsin: Dry lime-sulfur gives very satisfactory returns in comparison to the liquid material. - Vaughan.

Fire blight caused by Bacillus amylovorus (Burr.) de Toni.

During the season 1918, fire blight had its usual wide range over the United States. It was reported from regions as far north as upper Vermont, Montana and Washington, and as far south as Georgia, Texas and New Mexico, with positive occurrence reported from thirty-four states.

Fire blight on apple was not generally more prevalent than normal last year (1918) and, as usual, was of less importance than such other common diseases of the apple as scab and bitter rot. In some states however it was severe and more prevalent than usual. It was common, although less prevalent than usual, in the Rocky Mountain region, Ohio, northern Illinois, Mississippi and Delaware; the disease was more prevalent than usual in Connecticut, New Jersey, Pennsylvania (portions), Tennessee, Wisconsin, Nebraska, western Illinois, and western Kentucky. The disease was also reported as severe in Iowa and Georgia, moderate to slight in most other states.

The percentages of apple trees injured ranged from 2% to 25% by states. In Georgia often 50% of the new shoots blighted. The average percent of trees injured, using figures from seven states, is 14%. Actual losses range from less than 1% in Massachusetts to 40-50% in Kentucky. The average percent of

loss for nine states making estimates is about 8.7%. In western Illinois 90% of the Jonathans in some orchards lost their blossoms through blight.

Twig blight seems to have been the prevailing form of fire blight on apple in many sections of the country. This was particularly true in Connecticut, Massachusetts, Georgia, Ohio, western New York, Tennessee, central and western West Virginia. In Ohio Professor Selby attributes the unusual twig blight to an outbreak of "tissue penetrating insects". Cankers are given special mention from Minnesota and Nebraska; collar blight was general in Massachusetts and Pennsylvania, and in the latter state more serious than usual. Blossom blight was apparently worst in western Illinois, Massachusetts, and the lower Hudson Valley, New York. Fruit blight was important in Georgia and occurred to a limited extent in western New York. Selby states that in Ohio some cases of blight started on the leaf-border.

It is not easy to determine what set of weather conditions is regarded as "favorable" or "unfavorable". In most cases no indication was made in the reports as to the type of weather conditions prevailing; only the words "favorable" or "unfavorable" were used in such cases. In other instances the word "unfavorable" was supplemented by "dry", "hot and dry", "cool and dry". Evidently the temperature factor is not wholly agreed on, although all who commit themselves state that "dry" weather is "unfavorable" to blight. A few reporters venture an opinion on the influence of temperature. Possibly moisture is a more limiting factor than temperature. There are probably other factors which influence outbreaks of blight.

The general, relative prevalence of twig blight may be correlated with heavier rainfall later in the season. It was comparatively dry, generally, at blossoming and there was slight prevalence of blossom blight. It is interesting to note that in western Illinois wet weather prevailed at blossoming and a heavy blossom infection by B. amylovorus was observed in some orchards.

The following varieties are listed as susceptible: Spitzenberg (Conn., Oreg.), Jonathan (Ill., Mo., Oreg.), Transcendent (Minn., Mo., Wisc.), Wealthy (Mo., Wisc.), Greening (Minn.), Alexander (N. Y.), Twenty Ounce (N. Y.), Siberian Crabs (N. D., S. D.), Grimes (Oreg., Pa.), King (Oreg.), Ben Davis (Pa.), York Imperial (Pa.), Stayman (Pa.), Yellow Transparent (W. Va.), summer varieties (Ohio).

In South Dakota Dutchess types were said to be resistant.

Dates of first recorded appearance of fire blight on apple:

March.....	Tennessee	June 4.....	Minnesota
April 1.....	Mississippi	June 6.....	Kansas
May 1.....	Georgia	June 10.....	Massachusetts
May 6.....	Pennsylvania	June 15.....	Vermont
May 8.....	Oklahoma	June 15.....	Montana
May 10.....	Virginia	June 20.....	Connecticut
June.....	Wisconsin	June 29.....	New Hampshire

Since twig blight prevailed, it is not surprising that the above dates are mostly after blossoming time.

It appears, from reports, that in a few states no control measures are taken against fire blight on the apple. In other states the cutting-out method is employed. In Oregon many growers fight the disease successfully, but it is worst wherever the growers are not alert. In Minnesota the opinion is that pruning for blight on apple is on the increase. In Pennsylvania, Orton says of collar blight: "Cleaning away the soil from the collar in the spring has apparently been beneficial in Franklin County. This appears to allow the

cankers to dry out and favors callus formation." In Wisconsin, Vaughan reports the use of B. G. Pratt's Scalecide and desires advice of its use elsewhere.

A matter of historical interest is that fire blight was found for the first time in Douglas County, Oregon, according to the collaborator's statement.

Bitter rot caused by Glomerella cingulata (Stonem) S. & S.

The range of bitter rot was slightly restricted in 1918 as compared with previous years. Fewer reports of its occurrence around the margin of the "bitter rot belt" have come to the Office, and it did comparatively slight damage in Arkansas and Virginia where it is often so destructive. In 1918 it was negligible in Massachusetts and New Jersey, where it is never a serious factor in apple growing, and it was likewise rare in Illinois, Missouri and Oklahoma where in some years it becomes very destructive. The exceptionally dry weather is held responsible for the relatively light occurrence of bitter rot in these latter states. The disease was abundant as usual however in the apple regions of South Carolina, Georgia, southeastern Alabama, and Tennessee.

In South Carolina the unsprayed fruit showed 75% rot. In Georgia losses were in some cases heavy and in northern Alabama the disease was quite severe. Heavy losses in states of this region are not exceptional. In years when the weather is favorable to the fungus (warm and moist) bitter rot is both frequent and abundant in practically all apple localities south of the line of the Ohio River.

During the years 1917 and 1918, the following data on varietal susceptibility have been received:-

1917 Conn. - Early varieties most susceptible
 Mo. - Susc. - Huntsman, Grimes, Jonathan
 N. Y. - " - Chenango
 Pa. - " - Grimes, Summer Rambo
 Resistant - Stayman, Wagoner, Williams Early Red
 Va. - Susc. - Yellow Newtown, Ben Davis
 Resistant - Stayman, York Imperial
 1918 Mo. - Susc. - Bismarck

In northern states like New York and Connecticut, doubtless temperature is a factor limiting the disease to early varieties (Chenango, etc.). In Virginia, Fromme suggests that the supposed "immunity" of the York Imperial may be due to the fact that this variety is grown in regions where bitter rot is not prevalent.

Dates of appearance:

1917

June	Alabama	Aug.	Arkansas
July 1	Virginia	Aug. 20	New York
July 10	Illinois	Sept. 12	Pennsylvania
July 28	N. Car.	Oct. 12	Ohio

1918

May 15	Georgia	July	Tennessee
June	Missouri	Aug. 20	Massachusetts
June	Oklahoma	Aug. 20	Virginia

The need for closer observation as to the dates of first appearance is apparent. In general the disease is expected to put in its appearance in warm, rainy weather. Doubtless a comparative study of weather conditions in bitter rot states in epidemic and non-epidemic years would reveal some interesting correlations. Likewise a comparison of climatic conditions (moisture and temperature) prevailing in regions in which the disease is abundant on the one hand, and rare or absent on the other, would show interesting and valuable data.

Blister canker caused by Nummularia discreta Tul.

The range of blister canker apparently has not been increased during the past year (1918). It was reported from Missouri in 1903 and has consistently been reported to the Office from the central west and the Ohio valley. It is most abundant in three rather distinct regions: - (1) western Iowa and eastern Nebraska; (2) southwestern Missouri and northwestern Arkansas; (3) along the Ohio river. It also occurs to a slight extent as far south and west as New Mexico and Texas, southeast in South Carolina, northeast in New Hampshire, and central northwest in Michigan and Wisconsin. So far, it is unknown on the Pacific Coast. Possibly climatic conditions there are unfavorable to the fungus.

The disease is most serious in the three regions already described, and in these areas it ranks as one of the most destructive of their apple troubles. In Arkansas 10% of the trees were reported as injured in 1912; the following year 50% were affected, and it has been important there in other years. In 1918 the disease was reported from Kansas as second in importance only to blotch. Heavy losses are incurred also along the Missouri and Ohio Rivers. In other sections it is common but does less injury. In Ohio there was an apparent spread of the fungus between 1910 and 1915. In 1917 the report came from Virginia that the disease, while present in scattering areas, is becoming more prevalent. In all regions only woody parts are affected. Trees 15 years or older are affected more than younger trees, although Manns reports blister canker on nursery stock in 1913 from Delaware.

The weather relations of N. discreta seem to offer an interesting field of study. In 1915, Reed of Missouri, stated that the disease was relatively scarce owing to the unfavorable season, and he remarked that "a wet season seems unfavorable to this canker." (See also work of Gloyer: Ohio Agr. Exp. Sta. Circ. 125.)

The Ben Davis variety is commonly susceptible, as indicated by the reports from New York, Pennsylvania, West Virginia, Illinois, Iowa and Nebraska. It affects also the Gano and Fameuse (Iowa), Grimes and Willow Twig (Illinois), Sutton (New York) and other varieties. Very often neglected trees suffer more than others.

Excision methods have been used with success in Ohio and Pennsylvania. First reports of the disease came from Nebraska in 1906, Michigan 1911 and South Carolina 1916. It is known however, that Schweinitz collected the fungus in the eastern United States in 1834.

Black rot caused by Physalospora cydoniae Arnaud (= Sphaeropsis malorum (Berk.) Pk.)

This disease apparently occurs only in the eastern half of the U. S. and in Santa Fe County, New Mexico. It was moderate in most states, except in Virginia and southern Pennsylvania and Illinois. In Pennsylvania 25% injury is

reported from the eastern portion, being most injurious on trees in low soils where the humidity is higher. In Virginia it was unusually severe, many trees having been completely defoliated by August; the injury is rated at 50%. In Illinois, black rot was reported as not serious on July 1, but by November 15 was very serious, especially where codling moth was not controlled. It gave little trouble where codling moth was controlled. The fungus followed injuries produced by the larvae of this insect. This phenomenon is not uncommon elsewhere in some years.

All three forms of the disease (fruit rot, leaf spot, and canker) are not always abundant in any given region. Black rot was especially reported from Georgia, Illinois, New Jersey, Tennessee and West Virginia, and in Ohio it appeared as blossom-end rot; leaf spot from Alabama, Connecticut, Missouri, New York (lower Hudson Valley), Ohio, Pennsylvania, Tennessee, Virginia and West Virginia; canker, Minnesota and New York.

Susceptibility of varieties seems to depend on the nature of the injury. In Pennsylvania and New York, Baldwins and Chenango are especially susceptible to leaf spot although Ben Davis and others are also susceptible to this form of the disease in these states. In New York, Twenty Ounce are particularly susceptible to canker. In West Virginia, Ben Davis suffered worst from black rot.

Leaf spot appeared on the following dates:

- 1918 - May 10, Pennsylvania
- July 1, Connecticut
- 9, Virginia
- 1917 - July 2, Ohio.

Canker treatment does not seem to be generally practiced. Spraying for leaf spot gave good results in West Virginia, whereas dust gave only fair control. The control of codling moth in Illinois has already been mentioned as having an important bearing on black rot control. In some states the disease requires no special treatment.

Blotch caused by Phyllosticta solitaria E. & E.

This disease appears to remain limited to the eastern half of the United States - west in Nebraska and Kansas, south in Texas and southern Mississippi, and north as far as northern Pennsylvania. It is rare or unknown in areas farther northward, although it was found in one nursery in Wabasha County, Minnesota, in 1917. In 1918, it was very severe in southern and eastern Arkansas, southeastern Missouri, eastern Kansas, Illinois and southeastern Pennsylvania. In the last-named state it was more prevalent than usual, and Orton believes it to be on the increase and fast becoming one of the most serious apple diseases in the state. It is moving northward. In Ohio it is also said that it threatens to become one of the most serious of the apple diseases. In Virginia, Fromme received more reports of its occurrence than in any previous season. Blotch is likewise on the increase in West Virginia, although heavy damage is not yet the rule.

Heaviest losses come about by injury to the fruit. In Illinois, serious cracking of fruit resulted from blotch, coupled with peculiar weather conditions. In Pennsylvania, lesions occurred not only on fruit but on leaf-petioles with consequent defoliation. Leaf-spot was especially mentioned in reports from Delaware and South Carolina. Twig cankers are doubtless general; Selby notes that cankers are frequent wherever fruit blotch occurs in Ohio.

The Ben Davis is generally the most susceptible variety. Other susceptible varieties were reported as follows: Stark, Mann, Rome, Grimes (Ohio), Northwestern Greening (Ohio, Missouri), Arkansas Black (Oklahoma, Missouri), Gano (Oklahoma),

Smith Cider (Pennsylvania, New Jersey), Maiden Blush (Pennsylvania, Missouri), Early Colton, White Pippin, Wealthy, Early Harvest, Yellow Transparent (Missouri), Genet and Cooper Early White (Nebraska). Varieties more or less resistant:- Winesap and Jonathan (Oklahoma), Stark (Pennsylvania), York Imperial (Virginia), Milan and Winter Winesap (Missouri). It will be noted that Stark appears relatively susceptible in Ohio but relatively resistant in Pennsylvania; perhaps in the latter state the Stark is merely "less susceptible" and may be transferred to the susceptible group.

Blotch appeared unusually early in Ohio; ordinarily sprays applied July 15 will control, but in 1918 the disease was found June 7. It was reported elsewhere as follows:-

May.....	Missouri, Oklahoma	June 13.....	Kansas
June 8.....	Illinois	July 2.....	Virginia
June 10.....	Georgia	July 9.....	Pennsylvania

The early appearance of blotch in Ohio calls for a revision in the generally recommended spray schedule. Bordeaux is the fungicide used largely, and in general, where properly applied, is satisfactory. Blotch was more severe in dusted and unsprayed orchards than in sprayed orchards of Arkansas (Roberts, U. S. Dept. Agr.). In Illinois, the susceptible Ben Davis, even in many sprayed orchards showed 80% blotch and 10-35% loss of fruit. Evidently spraying is not invariably dependable in that state.

Rust caused by Gymnosporangium Juniperi-virginianae Schw.

Apple rust occurred widely but on the whole moderately, over the eastern half of the United States in 1918. It was most prevalent and severe in Virginia, southwestern Arkansas, western Iowa and eastern Nebraska. It was also troublesome in southwestern Wisconsin and Tennessee. The disease was reported from Colorado although apparently was not observed elsewhere in the Rocky Mountain region. It was found as far south as northeastern Texas and southwestern Mississippi. It occurred as far north as North Dakota. Rust was less prevalent than usual in Connecticut and Pennsylvania, and in West Virginia it was the mildest it had been since 1909.

In most states the disease was of slight importance. From West Virginia where it is sometimes damaging, comes the report that rust was unimportant because of the unfavorably low temperature occurring at periods when moisture conditions properly prevailed. Taking the country as a whole, if it can be said that rust was less prevalent than usual, it seems that unfavorable weather and cedar-destruction are responsible for the reduced importance of the disease. The following table gives injury and loss estimates:-

	<u>Injury</u>	<u>Loss</u>
Georgia-----	5% -----	small
Kentucky-----	-----	2%
Minnesota-----	-----	Less than 1%
Pennsylvania-----	5% -----	1.5%
South Carolina-----	-----	2%
Tennessee-----	10% -----	2%
Texas-----	-----	slight
Virginia-----	-----	\$350,000 50% on York Imperials
West Virginia-----	-----	2%

Although not a large number of collaborators emphasize the nature of injury and loss, it is of interest to note that leaf infections were especially reported from Pennsylvania, New York and Tennessee. From Canada, comes the report that, while no rust occurred in 1918, only a few leaves were found affected in five years.

Varietal susceptibility to rust

<u>Most susceptible</u>	:	<u>Observed on</u>
Iowa..... Wealthy, Ben Davis	:	Connecticut... Wealthy, Banana
Missouri..... Jonathan, Rome	:	New York..... York Imperial, Twenty
New Jersey.... Wealthy	:	Ounce, Opalescent,
Pennsylvania.. York Imperial	:	Wealthy, Belleflower,
Virginia..... York Imperial, Ben Davis	:	Hubbardston.
	:	South Dakota.. Only trees with "blood"
	:	of <u>Pyrus ioensis</u> (West-
	:	ern Crab).
	:	Wisconsin.... Wealthy
<u>Most resistant</u>	:	
Virginia..... Winesap, Stayman, Delicious,	:	
Missouri Black Twig	:	

Dates of first report in 1918:

March 30..... Mississippi	July ?..... Wisconsin
May 1..... Georgia	July 18..... Pennsylvania
May 15..... Minnesota	July 23..... Connecticut
June 10..... Tennessee	

Cedar eradication is practiced in Virginia, West Virginia, Wisconsin and Nebraska. In the last-named state a general movement is on foot to eradicate red cedars in the apple regions in the southeastern portion of the state. Spraying is reported successful in Tennessee in the control of apple rust.

Northwestern anthracnose caused by Neofabraea malicorticis (Cord.) Jackson.

The northwestern anthracnose of apple was reported for 1918 from Washington, Oregon and Nevada. In addition to the states it has been reported previously to the Office from Idaho and Nebraska. Very recently however, it has been determined that the reports from Nebraska (which came to the Office in 1906 and 1917) were incorrect. Apparently then the disease does not occur east of Latah County, Idaho. Although the fungus is present in the apple regions of eastern Washington, western Nevada and western Idaho, it does most damage west of the Cascade Mountains, in the states of Washington and Oregon. In the Willamette, Hood River and Rogue River valleys, it has been serious for several years. In 1918 a survey of five counties in Oregon showed that it was most prevalent in Benton County.

So far as known the fungus does not occur in any of the apple regions of the middle west or east. Probably weather conditions are not favorable, or possibly it is a mere matter of the non-introduction of the fungus.

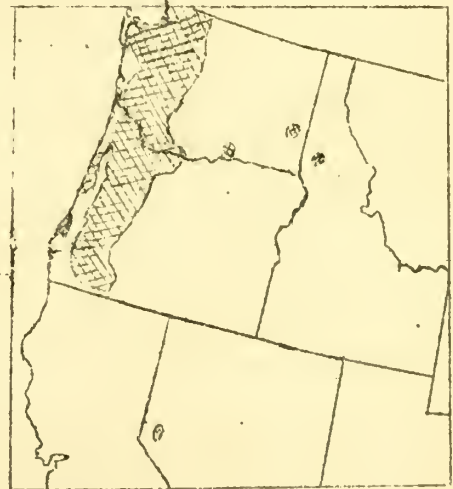


Fig. 1 Occurrence of Neofabraea on apple as reported by collaborators. Summary of all reports.

Anthraco nose has been said to be the most serious apple disease in the northwest. At any rate it is a close competitor of scab. Estimates of losses are difficult to prepare owing to the nature of the injury produced. The chief damage comes through the formation of cankers on the limbs. Young trees may thus be killed. In addition, the fruit may be rotted in the field or in storage. In 1911, there was considerable loss through rotting in storage. Early fall rains favored infections which occurred prior to picking.

It seems clear, from reports, that outbreaks are favored by rainy weather in the fall. In 1907 the disease was prevalent owing to cool damp weather the preceding autumn. Again early fall rains in 1910, 1912 and 1916 resulted in abundant infections which were conspicuous in 1911, 1913 and 1917 respectively. In the Willamette Valley, Oregon, the disease was especially bad in 1917. This is reported to be traceable to a laxity of fall spraying owing to the high cost of copper sulfate. In 1918 statements came from the Pacific Coast that the disease was serious where fall spraying is not practiced, and that it is negligible where the orchards are properly sprayed.

The range of the disease also indicates a close relationship to weather. The fungus is prevalent west of the Cascade Mts., where the rainfall is heavy, but is neither frequent nor abundant east of these mountains where rainfall is relatively light (see map).

The disease is less serious in Oregon on Newtown and Gano than on other varieties, but all sappy varieties like Esopus Spitzenberg and Baldwin are highly susceptible.

Fall spraying is satisfactory. Strong bordeaux is advised, 6-6-50, (1) just after picking, (2) about 2-3 weeks later. An application before picking is advised when weather becomes wet.

In general the situation is as follows:- the disease has done and may still do considerable damage. But fall spraying seems to have brought the trouble under control. Its occurrence eastward should be sought.

Root rots caused by: *Armillaria mellea* (Fries) Quel.
Clitocybe monadelphica
Ozonium omnivorum Shear
Xylaria spp., etc.

The apple root rot situation in the United States is not well understood. In the Pacific Coast region it seems clear that *Armillaria mellea* is the chief, if not the only, disturbing factor. In the Mississippi Valley, southern Texas and the Virginia section *Clitocybe monadelphica* is reported. In Arkansas, *Armillaria mellea* is also reported, and it has been found in Ohio and Pennsylvania. The black root rot fungus, or fungi, (*Xylaria* sp. or spp) has been observed in North Carolina, Virginia, Massachusetts, New York, Indiana and Illinois. Its parasitism is yet to be demonstrated in the last four states. In Texas and New Mexico, *Ozonium omnivorum* is prevalent. It possibly occurs elsewhere according to literature.

In several states the cause of apple root rot is not known; possibly several kinds occur. This meager state of knowledge is admitted from Ohio, Pennsylvania, New York and New Mexico, and doubtless other states might properly be added to the list.

Bitter pit (Non-parasitic)

This disease occurred in the Pacific Northwest and the New England States in 1918. It also occurred in Ohio where it was more severe than in 1917. In Massachusetts, New York and Oregon it was generally prevalent but caused slight loss except on the Baldwin. In Oregon, 50% injury was observed in individual cases.

Previous records indicate the occurrence of bitter pit in all the important apple sections of the United States, except the Ozark Region. In the irrigated sections of Washington it is very prevalent on certain varieties. Its abundance elsewhere, seems dependent on a peculiar set of weather conditions not altogether understood. In 1917 Selby reported that a light crop and abundant moisture favored bitter pit in southeastern Ohio. In the same year Barss reported that a long dry summer favored the trouble in Oregon.

The Baldwin is the most generally susceptible variety. The Northern Spy also suffers commonly. In Washington it is prevalent on Grimes, Black Twig and Belleflower. In Pennsylvania the Ben Davis, King David and York Imperial, in addition to Baldwin and Grimes, are susceptible.

Fruit spot caused by Phoma pomi Passer.

In 1918 Phoma fruit spot occurred in New England and the Ohio Valley. In years past the disease has also been reported from Texas, the Ozark Region, Indiana, Michigan and the Appalachian Region. The only report of its occurrence in the West is from Idaho in 1913. In 1916, it attracted attention for the first time in Virginia. In many states the disease is neither frequent nor abundant and losses are often confined to certain varieties. The disease is most common in southeastern New York; Connecticut, Massachusetts and New Hampshire. In 1918, however, it was generally much less prevalent than in 1917 or other years. It is most severe when rains are abundant in midsummer and late-summer seasons. Weather conditions prior to the last of June seem to have little influence. In this connection dates of appearance, as reported, follows:

Aug. 11, 1907	..... New Hampshire	Aug. ? 1911	..... Pennsylvania
Aug. 14, 1908	..... New Hampshire	Sept. 12, 1917	..... Pennsylvania
Aug. 20, 1918	..... Connecticut	Sept. 15, 1916	..... Virginia
Aug. 21, 1909	..... Pennsylvania	Oct. 1, 1910	..... Maine
Aug. ? 1908	..... Pennsylvania	Oct. ? 1912	..... Ohio
Aug. ? 1910	..... Pennsylvania	Oct. 15, 1917	..... New York

The disease doubtless appears in some states earlier than the dates recorded. For example it has been seen in July in New York but no such early records happen to be on file in this Office.

The Belleflower is uniformly susceptible. Light colored seedling fruits are also very frequently affected. Other varieties especially susceptible are reported as follows:

Baldwin	Greenville	Northern Spy
Jonathan	Ben Davis	King
Virginia Beauty	Grimes	Yellow Newtown
Newtown Pippin	King David	Rhode Island Greening

It has been observed on several other varieties, notably Tolman. In Connecticut, Russett was most resistant in 1916.

Midsummer sprays are reported as satisfactory. Infections may begin in June and continue into September.

Powdery mildew caused by Podosphaera leucotricha (E. & E.) Salmon.

Most prevalent in Washington and Oregon. It was also reported from California, Nevada, Colorado, New Mexico, Texas, Arkansas, Illinois, Indiana, Wisconsin, South Carolina and New Hampshire. From Ohio, Selby reports apple mildew as due to Sphaerotheca pannosa, while in West Virginia, Sheldon reports Podosphaera oxycanthae on apple.

In Washington, powdery mildew in 1918 was very prevalent in the irrigated section of the central and western portions of the state, where it is one of the most serious of apple diseases. The damage there is mostly due to a reduction in the vitality of the tree and prevention of fruit bud formation. In the Yakima Valley, atomic sulfur and iron sulphide is generally used but in the Wenatchee Valley lime sulfur has been preferred. Growers claim that sulfur dust is as satisfactory as liquid for its control in the Yakima Valley (Heald). None of the sulfur sprays can be used after hot weather starts in these regions of intense sunlight because of the severe fruit burning which always results.

Jonathan spot (Cause debated)

During the years 1917 and 1918 Jonathan spot was reported from Washington, Illinois, West Virginia, New Jersey and Delaware. According to literature it occurs elsewhere. It develops on late-picked fruit and in storage. Other varieties besides the Jonathan are liable to show this or other similar spots. From Washington a "Jonathan freckle" is reported (1918) and is said to be distinct from Jonathan spot. In New Jersey, both Jonathan spot and blossom-end rot are attributed to Alternaria sp.

Blue mold rot caused by Penicillium expansum
(Lk.) Remend. Thom

Soft rot was reported from various apple regions of the United States and Canada in 1918. In Illinois, Anderson reports P. expansum as causing 20% loss in cellar storage; data regarding cold storage are difficult to obtain since storage men are reluctant to give out such information. In transit to cities east and southeast market inspectors report 5-26% infection.

Crown gall caused by Bacterium tumefaciens Sm. and Towns.

Crown gall apparently occurs all over the United States. In 1918 it was reported from New York in the northeast, southern Georgia, Alabama, Texas and New Mexico, and the Pacific northwest. It is apparently more injurious in the south than elsewhere. According to reports it was especially important in Texas, Arkansas, Alabama and Georgia. Most damage is done to nursery stock, although orchard trees in some regions suffer considerably. In New Mexico, Werkenthin found the disease on 10-12 year old trees and states that such trees do not hold their fruit well. In Alabama numerous galls were found (1917) on the trunks of old trees. Aerial galls were again reported prevalent from Alabama in 1918. From Texas 3% loss is reported; from Pennsylvania 5% injury, and it was especially bad in a block of young trees bought from a New York state nursery. Galls had been cut

off to disguise trouble. Various types of lesions, such as galls, (root and aerial), and hairy root were reported.

Brown rot caused by Sclerotinia cinerea (Bon.) Schrot.

This disease was reported in 1918 as occurring in New York, New Jersey, Delaware, Ohio, Illinois, Iowa and Washington, where it appeared in usual amounts. Between the years 1904 and 1918 inclusive, brown rot on apple has been reported to the Office from all the chief apple regions of the country. However definite reports of it from the following apple states have never been received: New Hampshire, Vermont, Massachusetts.

Brown rot is clearly one of the minor diseases of the apple, although highly destructive on stone fruits. In no apple region is the disease known to be a factor in apple production. This is probably due to the fact that fall and winter apples, which constitute the bulk of this fruit grown in the United States, ripen in the cooler seasons of the year. The fungus has a relatively high optimum temperature and is most destructive on ripe or ripening fruits. Whenever early apples are grown brown rot occurs to some extent, due no doubt to the favorable conditions of warmer temperature at ripening. According to reports, heaviest losses have been incurred in Delaware. Losses may occur in the orchard, in transit and in storage. In 1918 shipments from Delaware to Indianapolis, Indiana, all varieties were affected in transit. The Yellow Transparent showed 7% rot; dark early varieties showed 25% as opposed to 15% on light red varieties. In a shipment from Ohio to the same market brown rot for one car varied from 4% to 30%, average 8%. The disease is a storage trouble in Washington and elsewhere. Losses are recorded as early as 1904, from Arkansas, Iowa, Missouri, New Mexico and in subsequent years from many other states. The disease has not been reported to the Office as affecting leaves and bark.

A few years ago the brown rot fungus in America, on whatever host, was called S. fructigena. More recently it has been shown that the brown rot fungus in the United States is S. cinerea. Both species occur in Europe; the species fructigena more common on pome fruits (although known on stones), and the species cinerea more common on stone fruits (but known on pomes). The question still remains to be further investigated: - Does Sclerotinia fructigena occur in the United States?

Apothecia on apple have apparently not been reported in American literature. In 1914, however, C. R. Orton, Pennsylvania, reported to the Office that they occurred abundantly May 7, on Wolf River and Red Astrachan.

Brown rot is reported on the following varieties:- Wolf River, Red Astrachan, Yellow Transparent, Chenango, Wealthy, Genet.

Special spraying for orchard control is never practiced, so far as known. It would apparently be necessary only on early (summer and fall) varieties in a warm, wet season.

The disease is sometimes called black-rot because under certain conditions a black mummy is produced. It should not be confused with black-rot caused by Physalospora cydoniae which produces also both a black and a brown rot.

The trouble is reported to be more prevalent when apples stand near plums or peaches (Iowa, New Jersey).

European canker caused by Nectria galligena Bres.

To date the European canker has been reported as occurring in 1918 in Connecticut, New York, Pennsylvania, Ohio and Oregon. Records of the Office show that it also occurs elsewhere (see below). The earliest report comes from Connecticut in 1903. In 1907 it was first noted in New Hampshire and subsequently elsewhere as follows:- California (1908), Ohio and Washington (1911), Minnesota and North Carolina (1912), Maine (1913), Indiana and Pennsylvania (1915 ; but at this time cankers fifteen years old were observed), Massachusetts, New York and Oregon (1917). (But earlier records of its occurrence in New York are available in the herbarium at Ithaca.)

The disease is common in Maine (in some parts of the state), New Hampshire and Massachusetts but it is not a serious factor in apple-growing in these or other states.

European canker is a minor disease of the apple in the United States. The percentage of trees injured in any state is low, although isolated cases are on record where a large number of trees in an orchard were affected. Such cases are reported from North Carolina (1912), Pennsylvania (1915) and elsewhere. Only limbs are known to be affected.

Little data are at hand regarding conditioning factors. Clinton, 1917, believes that in Connecticut possibly the prevalence is correlated with winter injury. Barss, 1917, found the canker seriously affecting Red Cheek Pippin eight years old, while Newtowns and Spitzenberg standing beside hardly showed one typical case. In Massachusetts neglected trees are frequently infected.

The proper name of the fungus appears to be N. galligena Bres., although N. ditissima Tul., is more commonly used. The latter is saprophytic (see Phytopath. 3 : 35. 1913.).

Sooty blotch and Fly speck
caused by Leptothyrium pomi and Phyllachora pomigena.

In most eastern states this disease in 1918 was either as common as for the average year, or less than usual. It seems to have been worse in West Virginia than elsewhere. In 1917 the disease was abundant in Kentucky, Maryland, Pennsylvania and Virginia. In 1918 it was general in northern Alabama, especially on late apples. In Ohio (1917) Selby reported it as especially common on "aphis" apples. On occasions when the disease has been troublesome, late rains have favored. Shaded fruit, as well as fruit on trees in low or poorly drained soil, suffer worse. In Nebraska (1918) it was severe, locally at least on Oldenburg, Maiden Blush, Missouri Pippin and Genet, and moderate on Jonathan. In North Carolina (1917) green colored varieties suffered most. In Virginia (1917) all varieties were affected.

Late sprays were used in 1918 in Ohio. In West Virginia Bordeaux gave excellent control, although sulfur dust gave practically no control.

There is still doubt in minds of the collaborators as to whether or not sooty blotch and fly speck are the same. Investigations on this matter are under way in one of the states.

Winter injury caused by low temperatures.

The winter of 1917-1918 proved exceptionally injurious to apple as well as other fruit trees. Severe injury was reported to apples from all of the New England states, New York, New Jersey, Pennsylvania, Ohio, Indiana, Illinois,

Michigan, Wisconsin and Minnesota; and slight to moderate injury was reported from West Virginia and Kansas. As in the case of peaches, the trees, especially the older ones, went into the winter in an immature condition which rendered them more susceptible to freezing injury.

The injury was manifested in different ways depending on its severity. In many places in the more northern states trees were killed outright. Sometimes the trees leaved out in the spring and then twigs, branches, or the entire trees would die. It was common during the summer to find trees with a sickly yellow foliage. Dwarfed leaves and spurs were reported from Ohio. Much injury was reported to crotches and branches as well as to trunks. In New York and Pennsylvania root killing was reported and injury to the spurs, as shown by a browning of the sap wood and pith, was general in some states. This may be related to the unusually heavy blossom and fruit drop that was reported from New York, Ohio, and West Virginia.

The losses were extremely heavy. In Maine, where the trouble is reported as being the worst since 1906-07, thousands of Baldwin trees were killed and many more so severely injured that they were made practically worthless. In Minnesota 10% of the trees were said to be injured. In New York it is estimated that the crop was reduced by at least 50% because of winter injury. In Vermont from 10-15% of the total number of trees were reported killed and many more (15-25%) were injured.

Trees in undrained localities were more seriously affected than others according to reports from Ohio, New York, Indiana, and Illinois. Melchers of Kansas reported the trouble most serious in the valleys, and Coons in Michigan states that trees in exposed locations were most commonly affected. It seems to be the consensus of opinion of collaborators that the old trees and those that produced a crop in 1917 were more affected than young trees or older ones that were not productive the year before.

The following list of common varieties, arranged in order in which they were most affected, is given for New York: Baldwin (worst), Rhode Island Greening, Tompkins King, Hubbardston, Fall Pippin, Twenty Ounce, Ben Davis, Wealthy, Fameuse, McIntosh, and Oldenburg. The Baldwin was most susceptible according to reports from Maine, New Hampshire, Vermont, New York, Pennsylvania, Ohio and Indiana. The following varieties were also said to be especially affected: Stayman Winesap in Ohio, York Imperial in Pennsylvania, Rhode Island Greening in Vermont and New York, and Ben Davis in Indiana. Grimes Golden was among the varieties least affected in Indiana. (For fuller discussion of the winter injury situation see peach, page 24.)

Water-core (Non-parasitic)

In 1918 water-core was most common on certain varieties, having been recorded on Early Harvest, Tolman, Wealthy, Yellow New Town, Fall Pippin, York Imperial, Oldenburg, Sweet Bough, Yellow Transparent, Pound Sweet.

In 1914 Selby suggested as treatment the practice of prompt picking and low nitrogen supply.

Drought injury (Non-parasitic)

Apple fruits suffered from drought in several states in 1918. Irregular shaped apples often developed as a result of the death of local areas in the flesh. Coons, of Michigan, reports that tissue at the blossom-end suffered especially; he reports the trouble on many varieties. Selby states that drought "break-

down" in Ohio is similar to the Jonathan and Baldwin spots; on the surface it suggests water core. The trouble is noticeable only after enlargement by growth is checked and other parts have developed about it. He reports it as most severe on Northwestern Greening, Stark, York Imperial, and has also found it on Wealthy, Duling, Baldwin, Gano and Grimes. The disease was much more prevalent in Ohio in 1918 than in 1917, owing to the dry hot weather during the latter part of the summer. Giddings reports that many apples were injured by drought in West Virginia. It was also common in Massachusetts, especially on Baldwins, and reports of it also come from Washington and Oregon.

Cracking (Non-parasitic)

A very dry summer followed by a heavy rain and continued wet weather the latter part of August and in September resulted in severe bursting and cracking of apples in southern Illinois. Stayman cracked worst. Alternaria and Physalospora cydoniae followed cracking. -H. W. Anderson.

Late frost injury.

Late frosts caused a small amount of russetting on apples in Connecticut. It was reported July 31. Frost injury is also reported from Washington, where blistering of the leaves occurred. Late frosts greatly reduced set in Kentucky.

Hail injury

Hail injury was reported from Iowa, Connecticut and Vermont. The injury was severe in several parts of Iowa. In Connecticut the trouble was local and injured fruit and young twigs of early varieties.

Sun Scald

This trouble was reported from a few states, (West Virginia, Kansas, Ohio, North Dakota, and Connecticut). Apparently both fruit and limbs were injured.

Scald (Non-parasitic) and Decay (Parasitic)

Scald followed by decay (commonly caused by Penicillium) was reported from several points by Markets Inspectors.

Melhus reports in Iowa that apples in warm storage were injured in such a manner as to show a cloudy or fired appearance beneath the cuticle. Clinton also reports scald in storage in Connecticut.

Spray injury

Reported from Pennsylvania (arsenical), New Jersey, Ohio (arsenical). Russetting of fruit from the use of Pyrox and Bordeaux was common in Pennsylvania.

Pox canker caused by Leptosphaeria coniothyrium (Fckl.) Sacc.

This canker was reported in the spring and summer of 1918 from Kansas where it seemed to be alarmingly prevalent in Doniphan County, the Chief fruit

growing section of the northeastern part of the state. This is the first report of the disease from Kansas. H. H. Haymaker and L. E. Melchers furnish the following memorandum concerning it. "The disease was found in Doniphan County, affecting mainly the trees from two to five or six years old. About 3% of the young trees in orchards in the above counties have died and perhaps 10% of all young trees are affected. The cankers are from one-half inch to three inches in extent and are brownish, reddish, or yellowish in color. It has been found that the fungus that causes the disease is the same as that on raspberry, and that the canker is worst in orchards where raspberries are growing either between the rows of apple trees or in the vicinity. In Sedgwick and Reno Counties, where a search was made for the disease, none could be found, undoubtedly because of the scarcity or absence of raspberries. The disease was collected also in Jefferson, Wabaunsee and Sumner Counties, but was rare in those places."

Miscellaneous rots of fruits.

Alabama - Storage rots exceedingly severe.

Illinois - Botrytis rot noticed but not serious.

Ohio - Obscure rot under investigation. May be referred to Stevens and Hall's Alternaria rot.

Washington - Miscellaneous rot fungi reported (Penicillium, Alternaria, Botrytis).

New York - Phytophthora cactorum was found causing rot on Rhode Island Greening in the orchard.

New Jersey - Cephalothecium roseum reported.

Other diseases

Silver leaf caused by Stereum purpureum reported from Maine, always associated with winter injury (Morse). Reported also from Washington (Heald and Dana).

Leaf spot caused by Cercospora mali reported from Bexar and Guadalupe Counties, Texas, where the disease is unimportant.

Leaf spot caused by Phyllosticta pyrina was reported as common in New Jersey (M. T. Cook).

Cankers on limbs and trunk apparently associated with winter injury or root disease very prevalent in Pennsylvania. Cause undetermined.

Canker due to Coniothyrium fuckelii reported from Minnesota by Bisby.

Rough bark disease was reported as a minor trouble from Washington.

Cytospora canker reported from New Mexico. In Montana Cytospora leucostoma is reported to have been found apparently following winter injury and bacterial blight.

Brown bark spot, a spotting of limbs, reported from Washington as caused by "poor soil".

Surface canker caused by Myxosporium corticolum reported from Ohio. It is common in New York.

Soil trouble - Werkenthin (New Mexico) reported the prevalence of a trouble due to gypsum or soil exhaustion.

Coniothecium scab - Reported from Washington.

Chlorosis - Reported from New Mexico, where it is present in some parts of most every orchard in the Mesilla and Pecos Valley.

June drop - Chief trouble in Connecticut; especially severe on winter varieties.

Spot necrosis - Reported from western Washington; due to intermittent irrigation.

Cork - Noticed extensively on King in Oregon.

Rosette - One report from eastern Washington. Cause unknown.

Fasciation - Reported from southeastern Washington.

Dieback - Reported from many sections of Georgia. Pestalozzia developed in plates in several cases.

Alkali injury - Three reports from central Washington. Causes severe chlorosis.

Sap rot - In Ohio, where Schizophyllum commune followed winter injury.

----- ? - Septobasidium retiforme reported from Alabama where it is general. Also found on haw and pecan. In Mississippi Thelephora pedicillata is reported but is unimportant.

Collar rot - Reported from Ohio

Smallpox - Reported from Ohio.

Frog-eye - Abundant locally in West Virginia. Caused by Tlliosporium malifoliorum.

Bark galls - Reported from Washington. Cause uncertain.

Pimple disease - Reported from Ohio.

Measles - Local in Pennsylvania. Smith Cider appears to be most susceptible.

PEAR

Fire blight caused by Bacillus amylovorus (Burr.) de Toni.

In 1918, fire blight had its usual occurrence over the United States. As a rule it was less abundant than in 1917 although it was more severe in Connecticut, and local areas in the South. In Canada it was worse than in average years.

The disease in question is still of considerable importance. In Georgia 50% loss for the state is recorded; in New Jersey 15% injury; in Mississippi 15% injury.

As with apples, twig blight was the most prevalent form of the disease. Blossom blight, however, was especially noted in Massachusetts, Pennsylvania and New Jersey.

The early wet summer is held responsible for blight appearing worse than usual in Canada. In Pennsylvania fair weather at blooming is said to have favored blossom-blight, while later rains prolonged the growth and infection by the organism was easy. Dry weather is correlated with the lesser prevalence in Arkansas, Texas and Oregon (See apple data).

Sand pears showed marked resistance in Alabama. Bartletts more resistant in Connecticut but susceptible in New Mexico; Kieffers were resistant in New Mexico but susceptible in Alabama. Sheldon, Clapp, Flemish, and King Charles are also reported among the susceptible pears, while Anjou Seckel and Garber are resistant.

The dates of the first reported appearance of the disease correspond to the time when twig infection rather than blossom infection would be expected. They follow: -

March	Tennessee	May 10.....	Virginia
March 26	Mississippi	May 28.....	Pennsylvania
April	Louisiana	June 9.....	Connecticut
April 1 (approx)	Georgia	July 17.....	New Hampshire

Scab caused by Venturia pyrina Aderh.

Pear scab was generally less abundant during 1918 than the year previous. A light crop and dry weather seem to have been responsible for this condition. The disease was common, however, in some of the eastern states.

Leaf spot caused by Mycosphaerella sentina (Fr.) Schrot. (=Septoria pyricola).

Common, but not very destructive, in New York, Ohio and New Jersey. Locally destructive in Pennsylvania. Trace in Kansas. In 1917 it was also reported from Alabama, Massachusetts, Michigan, Nebraska, Ohio, Maryland and New Hampshire.

Black rot caused by Physoctenophora cydoniae Arnaud.

In 1918 this disease occurred in Arkansas, Oklahoma and Ohio.

Leaf blight caused by Fabraea maculata (Lev.) Atk.

This disease was reported in 1918 from Canada, Missouri and New Jersey. In previous years it has been found commonly in Missouri, Ohio, Georgia, Pennsylvania, Maryland and Iowa. It has also been noted in Washington, Nebraska, Alabama, Michigan, North Carolina, Virginia, West Virginia, Delaware, New York and Rhode Island. Most damage seems to occur in nurseries on seedlings. Defoliation sometimes occurs. Lime sulfur or Bordeaux controls the disease in New Jersey and Georgia.

Crown gall caused by Bacterium tumefaciens Sm. & Towns.

Reported in 1918 from New Mexico, Ohio and Pennsylvania. Previously reported from Massachusetts, Maryland, Kentucky, Mississippi, Arkansas, Idaho, Washington and Oregon.

Winter injury caused by low temperatures.

Winter killing of pear trees was reported from New York and Washington. In New York the trees were most severely injured in Oswego and surrounding counties where many orchards were nearly killed out. Both old and young trees suffered in this state and the varieties were affected in the following order: Dutchess, Angouleme (Dutchess), Bosc, Bartlett, Clairegeau, Seckel, Clapp's Favorite and Anjou. The hardiest variety was Flemish Beauty, although Anjou and Clapp's Favorite were not much affected.

Other diseases

Canker - Owens reported a rough bark canker from Oregon. In some places it did considerable damage. Cause not determined.

Red leaf - Prevalent on Kieffer in New York.

Hail injury - Local in Connecticut.

Brown blotch - Reported from New Jersey; less than usual.

Drought injury - Reported from Ohio and Washington.

Leaf spot caused by Phyllosticta pyrina - Reported from Ohio.

Frost injury - Reported from Washington.

Root rot caused by Ozonium omnivorum - Less than usual in Texas; drought seems unfavorable.

Brown rot caused by Sclerotinia cinerea - Pears were rotted in transit by this fungus, from Florida to New York and Philadelphia. From 25-75% infection in three cars (July 8 and 15). A brown rot blossom blight (caused by Sclerotinia) as reported from Washington.

Rots caused by miscellaneous fungi - Reported from Washington.

Winter injury - See general discussion.

Septobasidium pedicellatum - Common in Louisiana, but does slight injury.

QUINCE

Fire blight caused by Bacillus amylovorus (Burr.) de Toni.

Fire blight was quite injurious to quinces in 1918. It was reported especially from the northeastern part of the United States; New Hampshire, Massachusetts, Connecticut, New York, New Jersey, West Virginia, Ohio, Alabama and Nebraska. It was also said to be very abundant in Ontario, Canada in 1918.

Reports indicate that it was more prevalent than usual in New England, while in Ohio it was apparently less prevalent.

Ten to fifteen percent injury to the trees is reported from New York and two percent loss from Massachusetts. (See Fire blight of apple, page 3, and pear, page 18, for further information.)

Leaf blight caused by Fabrea maculata (Lev.) Atk.

Reported from New York, Ohio, Illinois, and Missouri. H. W. Anderson reported complete defoliation of 1400 trees in an orchard at Bloomington, Illinois, August 3. The trees had started to send out new shoots and the second crop of leaves was becoming badly diseased. In New York more or less occurred in most quince orchards.

Rust caused by Gymnosporangium clavipes Cooke and Peck.

Rust was more or less prevalent in northeastern United States as shown by reports from New Hampshire, Massachusetts, Connecticut, New York, New Jersey, Ohio, and South Carolina. In no case was it of any particular economic importance.

Other diseases.

Black rot caused by Phylospora cydoniae Arnaud (= Sphaeropsis malorum Peck) was reported from New Jersey (very common), Ohio and West Virginia.

Ozonium omnivorum was reported by J. J. Taubenhaus as causing a root rot of Japan Quince (Cydonia japonica) at Waco, Texas. The plant was dying from the disease.

Crown gall caused by Bacterium tumefaciens was reported from Ohio and Texas.

Powdery mildew caused by Podosphaera sp. was reported by Heald and Dana from Washington.

Winter injury was reported from New York. The injury took the form of a killing back of the twigs thus reducing the bearing surface. The killing of entire trees was rare.

DISEASES OF STONE FRUITS

PEACH

Brown rot caused by Sclerotinia cinerea (Bon.) Schrot.

Brown rot occurred in most states in the eastern half of the country in 1918. A slight amount was also reported from northwestern Oregon. In some sections the peach crop was greatly reduced by the cold winter (1917-1918), and in such localities while there were fewer fruits to rot, yet the disease added to the loss already incurred by low temperature. Brown rot was worst in the Gulf States and the Chesapeake Bay peach areas. A considerable amount of loss was incurred in transit.

Heaviest losses are reported from the lower half of Delaware, Georgia, (where brown rot is the most important peach disease), Mississippi, Pennsylvania, South Carolina. In some more northerly states brown rot apparently is potentially destructive, since it is abundant in unsprayed orchards, breaking out when the weather is favorable. In the South, of course, the higher temperatures favor the fungus and make control more difficult. Twig blight is reported from New Jersey, South Carolina and Pennsylvania; blossom blight from Delaware; leaf injury from South Carolina. Fruit rot was the prevalent and important form of injury. In the northern peach belt early varieties are usually affected more than late varieties, owing to the more favorable temperature at ripening of the former. In Pennsylvania, however, early and late varieties are equally susceptible. In Georgia all kinds are reported susceptible. In 1918 late varieties suffered most in Mississippi.

The disease is controllable in Georgia, Mississippi, New Jersey and Tennessee by spraying. In West Virginia sulfur dust was found quite effective against scab and brown rot (see Giddings: W. Va. Agr. Exp. Sta. Bul. 167). In Delaware, Manns states that "dusting has been very efficient on peaches. ----- I think more will take advantage of it in the peach industry here". Virginia - "We feel satisfied that dusting can replace spraying for all peach work except the dormant spray". -- Fromme. New Jersey - Good results from dusting peaches - Massey. Georgia - Dusting peaches in 1918 was very satisfactory - J. W. Roberts.

Leaf curl caused by Exoascus deformans (Berk.) Eckl.

The range of peach leaf curl over the United States in 1918 was general, but in most peach sections it was much less important than usual. In the Great Lakes belt only traces of the disease could be found even on unsprayed, most susceptible varieties. Dry spring weather, at bud-opening, is an obvious cause

for this comparative scarcity. In some of the northern states winter injury to buds and twigs appears also to have been a factor in the scarcity of curl. Selby mentions this condition for Ohio. In local areas around the Chesapeake Bay, however, curl was abundant, and in southwestern Virginia and portions of Pennsylvania outbreaks, although local, were severe. There was considerable curl also in local areas in South Carolina, Georgia and western Oregon. In some counties in Pennsylvania 25% of the trees showed curl, and in South Carolina and Georgia 10% injury to trees is reported.

Although unsprayed orchards suffered worse than properly sprayed ones, varietal susceptibility was marked in regions where the disease was prevalent. In Virginia Fromme noted the usual high susceptibility of Elberta and Garman (about 75% of the leaves heavily affected) while the Early Crawford was comparatively resistant (showing 5-10% leaf infection). Selby remarks that Chinese varieties, notably Elberta, are most susceptible in Ohio.

Curl appeared in states, by dates, as follows:

March 15.....	Georgia	May 1	Ohio
April	Tennessee	May 16	West Virginia
April 25	Pennsylvania	May 28	Connecticut
May 1 (about)	Arkansas		

Scab caused by Cladosporium carpophilum Thum.

In 1918 peach scab occurred as usual in the South, being widespread in South Carolina, Georgia, Alabama, Mississippi and Arkansas. It was also reported from Florida and Louisiana. In all these sections scab was observed in the orchard as well as in transit. In southeastern Pennsylvania it was very prevalent, but elsewhere in northern states the disease was less prevalent than usual. This was due, in part at least, to the light crop.

Losses and injury from peach scab were reported as follows: Georgia (50% injury in some orchards), Illinois (some in markets, none in orchards), Mississippi (20-30% injury, probably 10% loss), Oklahoma (slight), Pennsylvania (5% loss for state; 10-100% injury in southeastern portion, less elsewhere), South Carolina (bad) and Tennessee (10% injury).

Scab was observed in Florida March 12, and in Pennsylvania March 25.

Early peaches suffered most in Georgia and Virginia; late varieties suffered most in Ohio (Heath and Salway) and South Carolina. In Mississippi, seedlings are especially susceptible.

Spraying appears to be successful generally, since collaborators report that the disease does no damage where sprays are applied for it, and worst where not sprayed. Dust controlled scab satisfactorily in West Virginia in 1918. Manns reports the successful use of dust for peaches in Delaware. (See under brown rot.)

Yellows, Rosette, Little-peach (cause unknown)

Yellows was reported in 1918 as severe in West Virginia (2-3% injury), Virginia, and Pennsylvania (5% loss). It was also reported from Ohio, New York, Massachusetts, Connecticut, New Jersey and Tennessee.

Rosette was reported as causing slight injury in Georgia.

Little-peach was reported from Pennsylvania and New Jersey.

Black spot caused by Bacterium pruni E. F. S.

Black spot seems to have had approximately its usual range over the eastern half of the United States but was much less severe than usual. It was reported as common in certain sections of Arkansas causing considerable damage; quite common in Delaware and New Jersey; abundant on wood in Louisiana; prevalent in southern and southeastern Pennsylvania doing heaviest damage (sometimes 100% infection) in Adams county. Elsewhere the disease was reported as "less than usual", "none observed", etc. In 1917 black spot was the most serious peach disease in Oklahoma and was also very common in Arkansas, Maryland, New Jersey, Delaware, North Carolina and Michigan. C. R. Orton reports Salway as most susceptible in Pennsylvania.

Dates of appearance: - 1917, July 11 (North Carolina), July 14 (New York), August 23 (Ohio). 1918, June 16 (Pennsylvania).

The application of nitrate of soda is reported as giving good control in Arkansas.

The earliest record of the disease at the Office was supplied by R. I. Smith who observed black spot in severe form in Stewart county, Georgia, in 1906.

Coryneum blight caused by Coryneum Beijerinckii Oudem.

The Coryneum blight was first reported to this Office by Pierce in 1906. Subsequently almost annual notices of it have been sent from California, Oregon, Washington and, since 1912, from Idaho and Utah. In 1909 and 1910 it was reported from Mississippi, and at various times from Indiana (1910), Ohio (1911), New Jersey (1912), and Massachusetts (1915-1918). Its occurrence in the east seems doubtful in some cases, and further investigations appear necessary to fully establish the range of the disease.

Heaviest losses have occurred in California, Oregon and Washington. In the Willamette Valley of Oregon, it was serious on twigs in 1918. In this state it was also very serious in 1909; in 1910 and 1911 it was less serious; in 1912 and 1913 it broke out heavily again, and Jackson stated (1913) that it was fast becoming the most serious disease of peach in Oregon. In 1912 there was 50-75% injury in Utah, and in 1913 it injured 25% of the peaches in some cases.

The fungus is favored by rainfall. Prolonged spring rains favor fruit blight. Twig and bud blight may be prevalent after fall rains, but fruit blight may subsequently be uncommon if the spring and summer remain dry. In 1917 twig injury was serious after the wet season in 1916. The same year however the blight was rare on fruit because of the dry season in 1917.

Fall spraying with bordeaux controls twig and bud blight, while spring and summer sprays with lime-sulfur (self-boiled) control fruit blight.

Powdery mildew caused by Sphaerotheca pannosa (Fr.) Lev.

Powdery mildew was reported from Oregon, Washington, Utah, Ohio and Pennsylvania. Nowhere was it reported serious. Previously reported from Colorado, Indiana, Maryland, Michigan, Missouri, Nebraska, New Jersey, New York, South Carolina, Tennessee, Virginia, West Virginia, Massachusetts, Idaho, and New Mexico. Heald reports that growers in the Columbia River section (Washington) claim that dust is as satisfactory as liquid in control work.

Die-back caused by Valsa leucostoma Fr.

Reported from Arkansas (associated with frost injury), Georgia (general), Alabama (common in neglected orchards), New Jersey (occasional) and Ohio.

Root knot caused by Heterodera radicum (Greef.) Mull.

Nematode injury was reported from Georgia. Most complaints came from the southern portion of the state. Berry says: "It was observed that when root knot infested nursery stock was planted in the heavy red clay soils, the nematodes disappeared". Root knot has previously been reported from Florida (first in 1904) and North Carolina (first in 1915).

Winter injury (non parasitic).

The severe winter of 1917-1918 caused more damage to peach trees in the United States than has been experienced in many years. In many places, especially in the more northern peach states, older trees made a late fall growth. The cold weather came early, and the trees went into the winter in an unripe condition. Added to this was the fact that the winter was unusually severe and long continued. This combination of conditions resulted in heavy losses from winter killing.

The months of December and January, when the injury probably took place, were unusually cold in all but the extreme western states. The average daily departure below the normal over the entire eastern half of the United States was large, running as low as -14° in many places. Zero was attained during these two months in all states except Florida, Louisiana, California, Washington and Nevada. The coldest weather of the two months centered about Lake Champlain in the East and the Dakotas in the West. The lowest temperature for December was recorded December 31 from Northfield, Vermont, where the thermometer registered -41°F. , the lowest ever recorded for New England. The lowest temperature for January was -38°F. , recorded at Havre, Montana. February was not especially cold. In most places the month averaged slightly warmer than normal.

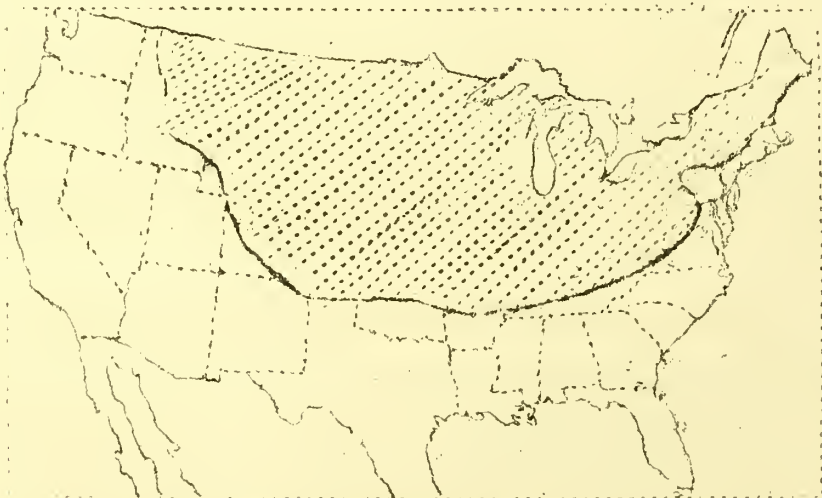


Fig. 2. Area where -10°F. or lower was attained during January 1918.

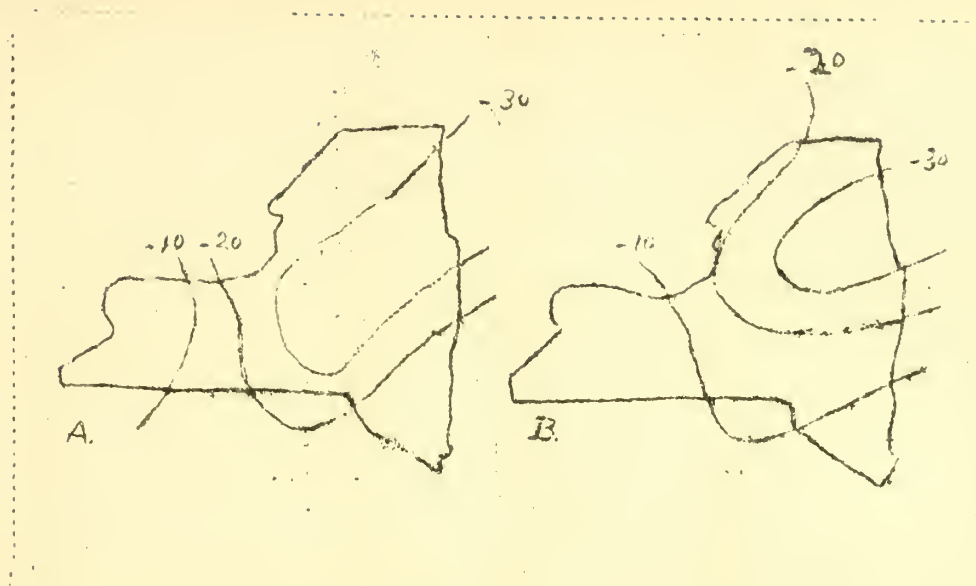


Fig. 3. Lines of lowest temperature in New York, A. December 1917, B. January 1918. The severity of the injury to peaches varies directly with the lowest temperature.

Killing of the wood of peach trees was reported from all states and regions north of the line indicating the temperature of 10° below zero in January (Fig. 2) and freezing of the buds occurred to a considerable extent south of that line. Thus Tennessee reported killing of many trees in the west, with a fair crop in the middle and a good crop in the eastern part of the state. Virginia reported very severe injury in the southwestern section, in Pennsylvania the most damage was done in the central and northern parts, and New York reported trees in the Hudson River Valley as least affected.

The injury varied from freezing of fruit buds to killing of entire trees. Along the southern border of the affected area injury to the buds and branches was most common but further northward the killing of the wood became more frequent until in the northern peach producing states whole orchards were ruined. In most states all gradations of injury from bud to trunk killing were reported depending on the locality of the state in which the trees grew.

Losses resulted in various ways, - (1) killing of trees, (2) killing back of branches, (3) killing of buds and so preventing set of fruit. In Indiana thousands of trees were reported killed and many more thousands damaged. In Michigan many whole orchards were ruined, necessitating the removal of all the trees. In Ottawa County, the largest peach growing center of Ohio, about 90% of the bearing trees of above four years of age were destroyed. New York reported 16% of the trees killed in twelve peach growing counties. Many farm orchards in Illinois had all of the trees killed. In Massachusetts from 5-50% of the trees were reported killed or badly damaged. In the northern and central counties of Pennsylvania 25% or more of the trees were severely injured.

A comparison of the production of peaches in 1918 with that in 1917 probably represents roughly the amount of loss in the 1918 crop from winter injury. The figures also indicate the states in which the heaviest losses occurred:-

Production of Peaches in bushels (000 omitted) 1917 and 1918.

	<u>1918</u>	<u>1917</u>		<u>1918</u>	<u>1917</u>
N. H.	0	47	Mo.	0	890
Mass.	9	145	Neb.	0	0
R. I.	2	20	Kans.	0	121
Conn.	15	263	Ky.	110	1,034
N. Y.	1,167	2,244	Tenn.	840	900
N. J.	792	871	Ala.	3,142	1,830
Penn.	1,210	1,440	Miss.	1,386	375
Del.	284	647	La.	615	478
Md.	600	975	Texas	2,041	2,352
Va.	578	800	Okla.	303	1,150
W. Va.	850	608	Ark.	260	840
N. C.	1,035	1,541	Colo.	754	1,200
S. C.	1,064	1,130	N. Mex.	85	60
Ga.	6,746	4,716	Ariz.	58	60
Fla.	264	122	Utah	11,080	900
Ohio	348	496	Nev.	15	6
Ind.	92	592	Idaho	80	165
Ill.	78	364	Wash.	1,130	504
Mich.	248	744	Oreg.	118	250
Iowa	0	30	Calif.	11,570	14,151

In New York a special survey was made by members of the Plant Pathology and Pomology Departments of the College of Agriculture with the object of investigating the extent of winter injury to fruits and the various phenomena connected with it.

The following summary of the situation as regards peaches has been furnished by H. H. Whetzel and L. R. Hesler:

"Bearing peach trees in the lake belt from Williamson in Wayne County east were largely killed out. Young trees and a few old orchards which did not bear heavily in 1917, came through in fairly good condition. Practically no fruit buds survived in this section however. From Rochester west along the lake there was some set of fruit especially in the Irondequoit section and in Niagara County. The trees from Williamson west while not usually killed were generally more or less injured. There was in some cases severe killing back of the twigs, some blackening of the body sap wood and as the season advanced there was evident a sickly yellow tinge in the foliage of most orchards.

"The peach trees in the Hudson Valley and along Cayuga Lake were severely injured but many came through and leafed out. None blossomed and while some orchards will recover, many are dead or so badly injured as to be worthless. The trees in many peach orchards have already been pulled out and many others will be removed this fall or next spring. The peach industry of the state has sustained a severe blow."

It will be noticed that the area of most severe injury, from Williamson east corresponds with that where the lowest temperatures for December and January were lower than 10° below zero (Fig. 3). During those months a wide range of temperatures existed in different parts of the state.

In general the older trees, especially those that bore a heavy crop in 1917, suffered most. This was reported as being the case in New York, Indiana Illinois and Ohio. In Indiana this is thought to be because the older trees made

the older trees made a late second growth while the younger and more vigorous growing trees matured normally.

Reports from a number of states show that the injury was worst where trees were growing under unfavorable conditions. In New York it was worst on poorly drained soils; in Indiana and Illinois trees in the river bottoms or trees that were devitalized from various factors were reported as most affected.

No marked differences in varietal susceptibility were reported from any state although there were indications in Ohio that Lemon Free and Smock were slightly more hardy than Elberta.

Other diseases

Rust caused by Puccinia pruhi-spinosae (= Tranzschelia punctata) (Texas) Previous to 1918 it was reported from Arkansas, California, Florida, Maryland, Mississippi, Alabama, Iowa, Louisiana, Missouri, South Carolina, North Carolina, Ohio, Oklahoma, Porto Rico).

Rot caused by Rhizopus - (Market inspection of peaches from Georgia).

Drought injury - (Nebraska)

Frost injury - Late spring frosts (Virginia)

Die-back - Complication of causes (Georgia)

Root rot - caused by Armillaria mellea (Oregon, Arkansas), and Clitocybe monadelphus (Arkansas), caused by Ozonium omnivorum (Texas), cause ? - (New Mexico).

Wood rots - (Arkansas)

Canker, apparently not Monilia - (Connecticut).

False mildew - caused by Cercospora persicae - (Ohio; previously reported from Arkansas, Delaware, Florida, Alabama, Maryland, Michigan, Missouri, North Carolina, South Carolina, Virginia, Washington, West Virginia, Alabama).

Gummosis - (Mississippi, Washington); caused by Bacterium cerasi - (Oregon)

Chlorosis - (Texas).

PLUM

Brown rot caused by Sclerotinia cinerea (Bon.) Schrot.

As in the case of brown rot of peach the disease was reported from states in the eastern half of the United States including Nebraska and Kansas. It was also reported from Washington and Oregon. It was apparently most abundant in the states along the Atlantic coast from Georgia north to New York and New Jersey.

The heaviest losses were reported from Georgia and South Carolina where 30% of the fruit was said to have been lost in each state. The next largest loss is reported from Pennsylvania where it was estimated that 20% of the plums were destroyed. In New York from 10-25% reduction in yield is recorded, and in Connecticut, Massachusetts, Virginia and Minnesota, 4, 2, 5 and 1% losses were reported respectively. In Ontario, Canada, W. A. McCubbin reported that a survey of plum orchards showed almost 8% orchard loss and about 8% loss in sale, making a total of at least 15%.

The dates of first appearance as reported by collaborators were:-

April 24..... New York (on blossom)	July..... Oklahoma
April 25..... Mississippi	July 31.... Pennsylvania
May 6..... Virginia	Aug. 5..... Connecticut
June 15..... Georgia	Aug..... Wisconsin
June 20..... Minnesota	

Spraying for brown rot does not seem to be practiced to any great extent in Pennsylvania and New York, and probably the same is true in many other states. It is reported as giving good results where used in New York, and South Carolina. (For information on occurrence of brown rot on other hosts see apple and peach pages 13 and 21.)

Black knot caused by Flowrightia morbosa (Schw.) Sacc.

This disease was frequently observed in many states in the eastern United States in 1918. It was abundant and severe, however, only in small, local areas. It was reported as especially destructive on wild species of *Prunus* in Arkansas and Connecticut. In Oregon it was reported only on wild cherry.

Pockets caused by Exoascus pruni Fckl. & Taphrina communis (Sad.) Gies.

Plum pockets were reported from the following states, most of which are in the northern part of the country:-New York, New Jersey, Pennsylvania, West Virginia, Ohio, South Carolina, Arkansas (prevalent on wild plums), Minnesota, Iowa, Kansas, Montana, and Washington.

The disease was worst in Montana and Minnesota. In Montana it was by far the most serious plum disease. It was reported that practically all the American plums in unsprayed orchards were lost because of pockets, and that the growing of this variety of plum has been brought to a standstill because of this trouble and a leaf gall mite (Montana Agr. Exp. Sta. Bul. 123:167-188, 1918).

In Minnesota the disease was general, causing about 1% loss. In some orchards it was observed as being so serious that nearly all the fruit on some trees was destroyed.

Since *Prunus americana* seems to be especially susceptible to pockets it is possible that the reason for the disease being worst in the north central west section is because *Americana* is the variety that is principally grown.

Leaf curl caused by Taphrina sp.

This disease, reported from Montana as being caused by Taphrina decipiens, caused considerable loss in some orchards where no spraying was done.

Leaf spot caused by Coccomyces prunophorae Higgins.

This leaf spot was reported from Massachusetts, New York, Pennsylvania, South Carolina, Ohio, Minnesota, Iowa, and Oregon. It was apparently most common in the eastern states and in Oregon. In general it did not cause much if any damage although it was estimated as affecting 25% of the leaves in Pennsylvania. Massachusetts reports severe injury to Japanese varieties. Spraying or dusting is reported as giving good results in New York.

Black spot caused by Bacterium pruni E. F. S.

Reported in 1918 from Pennsylvania, New Jersey, Arkansas, South Carolina, Texas, southern Illinois, and southeastern Missouri. The disease seemed to be worst in the south central part of the country. Texas reported 4% loss.

Crown gall caused by Bacterium tumefaciens Sm. & Towns.

Reported from Ohio and Washington.

Scab caused by Cladosporium carpophilum Thum.

Scab was reported from Pennsylvania, Missouri and Minnesota. The loss was small in all cases except in Pennsylvania where 2% loss was estimated. The blue varieties appeared to be most susceptible in Lancaster County of that state.

Powdery mildew caused by Podosphaera oxycanthae (Fries) De Bary

Reported in slight amounts from Pennsylvania, Ohio and Minnesota.

Winter injury

Reported as slight in New York, Ohio and Washington, apparently not injured nearly so much as peach, or apple. (See peach, page 24 and apple, page 14 for further data.

Internal brown spot caused by drought

Considerable loss to prunes was reported from the Willamette Valley, Oregon, and Clarke County, Washington. As high as 25% affected fruits were counted on a tree, and one or two cases were reported in which the entire crop dropped on account of drought injury. A leaf roll thought to be due to the same cause was also reported general throughout Oregon.

Other diseases

A wilt disease of plums suspected as being caused by Lasioidiplodia triflorae was reported as general in northern Georgia. Ninety percent of the trees were affected in some orchards.

Silver leaf. Specimens showing symptoms that resembled this disease were received at Pullman, Washington, from Clarke County.

Sunscauld was reported from four different counties in Ohio.

Root rot caused by Armillaria mellea reported from Texas.

Blight caused by Coryneum beijernickii reported from Washington.

Rust said to be caused by Tranzschelia punctata reported from Nebraska.

Little plum reported from New Jersey.

CHERRY

Brown rot caused by Sclerotinia cinerea (Bon.) Schrot.

Brown rot occurred commonly in the eastern part of the country and on the Pacific Coast. In New York and Oregon at least blossom blight resulted in the most damage. Reports of occurrence were received from New York, New Jersey, Pennsylvania, Ohio, South Carolina, Tennessee, Georgia, Missouri, Arkansas, Washington, Oregon and Canada. Losses of 3% in Pennsylvania, 25% in South Carolina, and 10% in Ontario, Canada were reported.

Mr. D. F. Fisher contributes the following report for the lower Willamette Valley, Oregon, where the disease caused about 30% reduction in yield. "As a blossom blight it was found only on low bottom land. Orchards in the hills were practically free from infection. Infection corresponded with the prevalence of apothecia. No control measures followed by the growers. In general season was unfavorable for the disease." (See, also, brown rot of peach and plum, pages 21 and 27.)

Black knot caused by Flowrightia morbosa (Schw.) Sacc.

Reported from Maine, New York, Pennsylvania, Tennessee, West Virginia, South Carolina, Ohio and Arkansas. A doubtful report was also received from Washington.

The losses from this disease do not appear to be great in commercial orchards. The most damage is done to scattered and neglected trees. Sour cherries are more affected than sweet cherries in New York. (See plum, page 28 for further data.)

Leaf spot caused by Coccomyces hiemalis Higgins=Cylindrosporium padi Karst.

Reported from Massachusetts, Connecticut, New Jersey, Pennsylvania, West Virginia, Georgia, Mississippi, Wisconsin, Missouri, and Canada. Reports indicate that in general the disease was not so severe as usual, altho for the most part this was probably due to weather conditions, still in some instances it was due to the increased employment of control measures. In some places considerable damage was done but this was mostly confined to rather small localities so that the total amount of injury to the crop was relatively small. Since no reports were received from the Pacific Coast in 1917 it is judged that the disease was of only minor importance in that region.

Bacterial gummosis caused by Bacterium cerasi Griffin.

Reported from Oregon and Washington. C. E. Owens contributes the following report of conditions in Oregon: "Present in Douglas, Jackson, Josephine, Lane and Benton Counties but doing more damage in Benton County. It occurs to a greater or less extent wherever cherries are grown but is most serious in the Willamette Valley, probably because climatic conditions are more favorable for its development there. The worst case was noted at Brownsville in Linn County where a nine-year old orchard which had originally contained 624 trees had but 128 trees left, due to gummosis. Another serious case was noted in the Milton-Freewater district where 50 trees were lost from an orchard originally containing 186 trees, a loss of over 26%."

Powdery mildew caused by Podosphaeria oxycanthae (Fries.) De Bary

Reported from New York (commonly present in unsprayed orchards), West Virginia (occasional, especially on sprouts in Monongalia County), Ohio, Wisconsin (observed only at Madison in July), Missouri (not common, loss very small).

Crown gall caused by Bacterium tumefaciens Sm. & Towns.

Reported from Ohio (Two counties), Oregon (not common) Washington (locally).

Witches' broom caused by Excascus cerasi (Fckl.) Sadeb.

Reported from Connecticut (occasional), Washington (reported from Pierce and Lewis Counties in the west), Oregon (general in the Willamette Valley but doing only little damage, most prevalent in neglected orchards).

Winter injury (non-parasitic)

Cherry trees were generally injured throughout the northern part of the United States during the winter of 1918. Reports of the injury have been received from New York, New Jersey, Ohio, Washington and Canada, but it is probable damage occurred in a good many other states. The most detailed information available on the subject is that from New York where a special survey was made by Chandler, Whetzel and Hesler. The following report has been contributed by these men: "Sweet cherry trees throughout the state, except in most protected areas, appear to have suffered seriously. A majority of them are either dead or so severely hurt as to make their recovery doubtful. In some sections, notably in the Hudson Valley they appear to have suffered but little. The dying of the limbs in the upper part of the tree after the leaves came out was the prevailing symptom. The crop of fruit on sweet cherries was generally very light, apparently due to the injury to the wood as the fruit either did not set well or fell prematurely. Sour cherries showed little injury to wood but in spite of the heavy bloom the set was not always good and premature falling of half-grown fruits was very common."

Other Diseases

A Root rot caused by Armillaria or Clitocybe was reported as fairly common in parts of Arkansas. Armillaria root rot is also reported from Ohio.

Cercospora circumscissa was reported from Ohio and Michigan. According to E. F. Woodcock this was the most destructive foliage disease with which cherry growers had to contend. The severe winter of 1918 so weakened the trees that they were in a condition to be readily injured by the fungus. 46% injury to foliage was evident in the orchards visited; this injury considerably reduced the yield and quality of fruit.

Fire blight caused by Bacillus amylovorus was reported from New Mexico.

A bacterial canker of undetermined cause is reported as causing 25% loss in an orchard of Windsor sweet cherries visited in Erie County, Pennsylvania. It is thought that the disease is the same as the western cherry canker.

Gummosis of a non-parasitic nature was reported from several parts of Washington.

Valsa leucostoma is reported as more prevalent than usual in Ohio.

APRICOT (See also peach).

Blight caused by Coryneum beijerinckii was reported from Washington and Oregon.

Scab caused by Cladopsorium carpophilum Thum. was reported from Oklahoma (very slight), Texas (unimportant), and California.

Shot hole caused by Coccomyces sp. was reported from Massachusetts and Texas.

Brown rot caused by Sclerotinia cinerea reported from Ohio and California.

Gummosis (non-parasitic) and frost injury were reported from Washington.

DISEASES OF SMALL FRUITSGRAPE

Downy mildew caused by Plasmopora viticola (B. & C.) Berl. & De Toni.

Downy mildew was comparatively rare in 1918. In the Chautauqua Belt of New York none was found, and only a trace found in the Keuka Lake region (New York). Slight amounts were found in Nevada, Texas, the Atlantic Coast states, Minnesota and Ohio. In West Virginia it was abundant on wild grapes although rare on cultivated farms. In Pennsylvania it appeared later than usual (July 10), owing to delayed rains.

Powdery mildew caused by Uncinula necator (Schw.) Burr.

Powdery mildew apparently was less abundant in 1918 than for several years. Reported present, but causing slight injury, in Oregon, Arkansas, Georgia, South Carolina and a few northeastern states. Reported August 1 from Oregon, August 24 from Georgia and September 7 from Pennsylvania.

Black rot caused by Guignardia bidwellii (Ellis) V. & R.

Reported from Pennsylvania south to Alabama, and from Louisiana north as far as Minnesota. Nowhere does it appear that black rot was serious, although most common in Missouri, New Jersey and West Virginia. In Ohio, although the most serious grape disease, it was less abundant than usual. In Pennsylvania leaf infection was heavy whereas fruit infection was very light. It was found in Georgia June 24, Missouri July 13, and Minnesota Aug. 5.

Crown gall caused by Bacterium tumefaciens Sm. & Towns.

This disease was reported from various parts of the United States in 1918. In Kansas, it was the most destructive disease of grape, although the loss was not over 3%. In Oregon it was locally serious on certain varieties. Elsewhere it was reported as occasional and limited.

Anthracoise caused by Gloeosporium ampelophagum Sacc.

Not reported from new territory. Occurs over eastern half of United States, usually causing only slight damage. In Missouri it was reported as having been more or less associated with black rot.

Other diseases and injuries

Ripe rot caused by Glomerella cingulata - (New Jersey)

Leaf spot caused by Cercospora viticola - (Ohio)

White rot caused by Coniothyrium diplodia - (Ohio)

Root rot caused by Dematophora necatrix - (Ohio), caused by Ozonium omnivorum - (Texas).

Lightning injury - (New York ?, Connecticut).

Bitter rot caused by Melanconium fuligineum (New Jersey)

Necrosis caused by Cryptosporella viticola - Fusicoccum viticolum - (New Jersey, New York, Ohio, Pennsylvania).

Sun scorch - (Porto Rico).

STRAWBERRY

Rhizopus rot caused by Rhizopus nigricans

Reported in the field and in transit from several important strawberry states. Weather conditions seem to have controlled the amount of rot in the patch, while the condition of the berries before shipment and the condition in cars factored in the rotting en route. In one case it was reported that large berries rotted much more than small ones. From 15% to 75% rot in single cars not uncommonly observed. "Leaking" commonly mentioned in reports.

Gray mold rot caused by Botrytis (cinerea?)

Reports indicate that Botrytis rot was not serious in fields except where it was cloudy and rainy toward ripening. Observations cover eastern and southern United States. No reports of it from the Pacific Coast. In Canada it was serious, reducing the whole crop by at least 10% (McCubbin).

Leaf blight caused by Mycosphaerella Fragariae (Schw.) Lindau.

Apparently leaf blight, or leaf spot, occurs wherever the strawberry grows but serious injury is not common, according to 1918 reports. In some cases a considerable percentage of leaves showed infection but damage to the crop was not appreciable. An interesting case was reported from Michigan by Woodcock:- two fields showed 10% and 20% of the leaf area decreased by spotting, but there was no evident decrease in yield.

Dates when first observed:- May 22, Georgia, Minnesota; May 20, Pennsylvania; June, Wisconsin.

The Klondike was very susceptible in Florida and Texas but resistant in Louisiana. The Missionary was resistant in Florida (locally). In Missouri the Aroma is more resistant than the Candy.

Generally little or nothing is done to control the disease in home gardens. In Hammond, La., the diseased leaves are stripped from plants at setting; in Iowa, cutting and burning vines immediately after harvest is practiced. The disease has only recently made its appearance in Iowa.

Other Diseases

Powdery Mildew caused by Sphaerotheca humuli - (Canada, Missouri, Nebraska, New Hampshire, New Jersey, New York, Pennsylvania, Ohio).

Rot caused by Physarum cinereum - (Nebraska); Diachea leucopoda - (Louisiana) Patellina - (Arkansas).

Anthracnose caused by Gloeosporium sp. - (Massachusetts).

Leaf Spot caused by Marssonina potentillae - (New Jersey); cause ? new - (Florida).

Rhizoctonia sp. - (Washington).

RASPBERRY

Anthracnose caused by Plectodiscella veneta Burkholder
(=Gloeosporium venetum Speng.)

Reported from Massachusetts, New York, New Jersey, Pennsylvania, Ohio, Michigan, Minnesota, Missouri, Arkansas, Kansas and Washington. It was a common disease in these states and in some places was destructive. Losses were reported as follows:

Minnesota - about 1%, New York - 5%, Ohio - 20% near Cleveland.

Black raspberries were reported as usually more susceptible than red varieties in New York.

Yellows (cause unknown).

Yellows was reported from Maine, Massachusetts, New York, Pennsylvania, Ohio, Illinois, Michigan and Minnesota. Possible losses of 1 or 2% of the raspberries in Massachusetts and 25% of the red varieties in New York are estimated.

The disease was first noticed as follows:

May 16 - Pennsylvania, June 12 - New York, June 28 - Minnesota.

Red varieties are susceptible and blackcaps resistant in New York.

Cane blight caused by Leptosphaeria coniothyrium (Fckl.) Sacc.

This disease was reported from Massachusetts, New Jersey, Pennsylvania, Ohio, Michigan, Arkansas, Kansas, Washington and Ontario, Canada. It is said to have caused from 1 to 2% loss in Massachusetts and 15% locally in Pennsylvania. It was reported as severe in Arkansas and severe generally near Cleveland, Ohio, causing as much as 20% reduction in yield. The fungus was found causing a canker of young apple trees in Kansas. (See apple, page 16).

Spur blight caused by Mycosphaerella rubins (Pk.) Jacz.

Reported from Pennsylvania, Wisconsin (general, as usual), Minnesota (general, rather more than last year), and Washington.

A loss of 2% is estimated for Minnesota. In this state the King and Outhbert varieties are reported susceptible and the Minnesota as resistant.

Other Diseases

Crown gall caused by Bacterium tumefaciens Sm.&Towns. - Common. In 1918 it was reported from Massachusetts, New York, New Jersey, Pennsylvania, Ohio, Minnesota, Washington, and Ontario, Canada.

Leaf spot caused by Septoria rubi Westd. - Reported in slight amounts from New York, New Jersey, Wisconsin, Missouri and Kansas.

Rust caused by Gymnoconia interstitialis (Schl.) Lag. - Reported from various states in northeastern United States and Canada. (See blackberry).

Armillaria mellea - Reported from Washington.

Wilt thought to be caused by Verticillium sp. - Reported by Chas. Chupp as common in Schenectady County, N. Y. The organism seems to be the same as the one on eggplant.

Botrytis - Reported by N. E. Stevens on fruit growing near Albany, N. Y., (July 25) and in Androscoggin County, Me. (August). Reductions in yield of 20% and 10% were estimated.

Mosaic - Reported by E. W. Olive as severe on certain forms in the lower Hudson Valley, N. Y.

A leaf curl of uncertain cause - Reported by W. A. McCubbin as widespread and often causing serious losses in Ontario, Canada. A survey showed about 7% of the plants to be diseased.

A rust said to be caused by Phragmidium imitans - Reported by F. D. Heald and B. F. Dana from Washington.

Sphaerotheca humuli - Reported from Minnesota.

Winter injury - Reported from Vermont (25% stalks killed), New York, and Canada (10% crop killed).

BLACKBERRY

Orange rust caused by Gymnoconia interstitialis (Schlecht.) Lagerh. and Kunkelia nitens

It is apparent that these rusts are confused in some states. Kunkel states that the long-cycled blackberry rust (Gymnoconia interstitialis) is more common in the north and in cooler mountainous regions along the Atlantic Coast. The short-cycled rust (Kunkelia nitens) is the prevailing species in the south. Of course both species overlap and both are found in West Virginia and north as far as the latitude of New York. In Maine, Dr. Kunkel has not found the short-cycled form. Data relative to the range and occurrence of these two species are still meager from several parts of the United States. In 1908 rusts of blackberries were reported from the following states:- Maine, Vermont, Massachusetts, New York, New Jersey, Pennsylvania, West Virginia, Tennessee, Georgia, Alabama (wild blackberry), Mississippi, Texas, Oklahoma, Arkansas, Ohio, Minnesota, Missouri, Kansas, Washington. Dr. Kunkel is anxious to receive specimens of blackberry and raspberry rust from any source, particularly from the Pacific Coast and the Rocky Mountain states. Material in condition for spore-germination is especially desired.

Leaf spot caused by Septoria ruoi Westd.

Reported from New Jersey, Pennsylvania, West Virginia, Ohio, Texas, Missouri, Kansas and Minnesota. In no state was it said to cause any special loss.

Other diseases.

Anthracnose caused by Plectodiscella veneta Burkholder = Gloeosporium venetum Speg. - Reported from New Jersey, Pennsylvania, Ohio, Texas and Washington.

Crown gall caused by Bacterium tumefaciens - Reported from Ohio, Texas, Oregon and Washington. No serious losses reported.

Yellow late rust caused by Kuehneola albida (Kuehn.) P. Magn. - Reported from Hammond County, La., on variety Wilson.

Cane blight caused by Leptosphaeria coniothyrium (Fckl.) Sacc. - Reported from Ohio and Washington.

Winter injury - Common in some of the northern states. Vermont reported a loss of 25% of the canes.

CURRENT

Rust caused by Cronartium ribicola Fisch. von Waldh.

This rust was reported to the Survey by collaborators from Maine, Massachusetts, Connecticut (on red, yellow and black currants), and New Jersey. A report from Ontario, Canada, indicates a reduction in yield in many places where the plants were badly attacked in previous years. The above states however report the injury to currants to be very slight. (See white pine blister rust in later report for further information.)

Leaf spot caused by Mycosphaerella grossulariae (Fr.) Lind.

Leaf spot was reported from Massachusetts (general, very slight damage), New York (common, first observed June 10 in Orange County), New Jersey (very common), Pennsylvania (first observed May 15 in Erie County), Ohio, Missouri (rather severe where observed), and Minnesota (trace).

Anthracnose caused by Pseudopeziza ribis Klebahn.

Reported in 1918 from Massachusetts (1/2% loss), New York (slight), Ohio, Minnesota (trace), and Washington.

Other diseases.

Cane blight caused by Botryosphaeria ribis Grossenbacher & Duggar. - Reported as very destructive in the southern part of New Jersey and severe locally in parts of Virginia. It was also reported from Stark County, Ohio.

Powdery mildew caused by Sphaerotheca mors-uvae (Schw.) B. & C. - Reported from Minnesota and Ontario, Canada. In Ontario it caused considerable damage to new growth in the few plantations where it occurred.

Nectria cinnabarina - Reported on currants in Minnesota and Ohio.

Angular leaf spot caused by Cercospora angulata Winter - Reported as occurring in small amounts in Minnesota.

GOOSEBERRY (See also currant).

Anthracnose caused by Pseudopeziza ribis, was reported from New Jersey and Minnesota.

Leaf spot caused by Mycosphaerella grossulariae (reported as Septoria ribis) occurred in New York, New Jersey, Ohio and Minnesota.

Powdery mildew caused by Sphaerotheca mors-uvae reported from New York, Washington, and Oregon (general but not so serious as usual).

Rust said to be caused by Puccinia ribis was reported from Ohio and Minnesota.

Rust caused by Oronartium ribicola reported from Connecticut. (See, also, currant, page 36 and pine in later report.)

Nectria cinnabarina reported from Minnesota (trace).

DISEASES OF SUBTROPICAL FRUITS

CITRUS

Scab caused by Cladosporium citri Massee.

Reported from Florida (about normal prevalence, traces in most every orange and grapefruit orchard, striking examples of high relative susceptibility of sour orange (Citrus aurantium) as compared with sweet orange and grapefruit), Alabama (scattered and slight on Satsuma), Porto Rico (caused heavy losses as usual) and Santo Domingo (heavy infection on sour orange. The disease will cause a serious handicap to grapefruit culture should it be taken up). Scab was found in one car of Florida grapefruit affecting 18% of fruit, also noted in one car of oranges which were probably of foreign origin.

Wither tip caused by Colletotrichum gloeosporioides Penz.

Wither tip was reported from Florida, Porto Rico, Mississippi and Texas. In Florida it was more prevalent than usual owing to the weakened condition of the trees which resulted from severe winter, and dry late spring and early summer. In Porto Rico it was common in all its forms but no serious outbreaks were reported.

Melanose caused by Phomopsis citri Fawcett.

Melanose was reported from Florida (about as usual) and Porto Rico (on grapefruit, known to occur in two groves). As a stem end rot it was more prevalent than usual in Florida, developing abundantly in some places. (See table I for losses in shipment.)

Foot rot caused by Phytophthora terrestris Sherb.

Foot rot was reported as occurring as usual in Florida. Sour stocks are mentioned as being immune. A similar disease was reported as being prevalent in a few groves in Porto Rico where it is being overcome by the use of resistant sour stocks.

Blue mold rot caused by Penicillium sp.

Blue mold rot has doubtless been greater than usual, partially because of careless handling of fruits by inexperienced help. The losses from this rot were large, being only exceeded by stem end rot. The accompanying table shows the percentages of rot found in Citrus inspected at various markets in the United States from May 1, 1918 to December 31, 1918.

Table I. Percentages of blue mold rot, caused by Penicillium sp., and stem end rot caused by Diplodia sp. and Phomopsis citri, as found by market inspection at various northern markets.

Source	Orange				Grapefruit				Lemon			
	No. cars in-spect-ed.	No. cars	% rot	No. cars	% rot	No. cars in-spect-ed.	No. cars	% rot	No. cars in-spect-ed.	No. cars	% rot	No. cars
Alabama	1	1	15	-	-	-	-	-	-	-	-	-
Calif.	13	13	18	1	32	-	-	-	5	5	12	-
Florida	115	8	52	10	42	41	3	23	1	38	-	-
		35	18	11	16		11	6	7	15	-	-
		18	5	13	4				7	5	-	-
		61	18	34	19		14	9	15	14	-	-
Source unknown	6	1	40	-	-	6	1	3	-	-	-	-
		1	9	-	-						-	-
Italy	-	-	-	-	-	-	-	-	11	1	20	5
											7	
Total and Av.	135	77	19	35	19	47	15	9	15	14	16	11
												9

Other diseases and injuries.

Black rot or blossom end rot caused by Alternaria citri - Reported by H. E. Stevens as being unusually prevalent in Florida. In some cases considerable injury was reported. The disease heretofore has not been considered serious.

Fruit rot of grapefruit and orange caused by Diplodia natalensis Evans - Caused heavy losses as usual to harvested fruit in Porto Rico. (See also Table I).

Blossom end rot of orange caused by Fusarium sp. - Reported from Porto Rico as less prevalent than usual.

Rust of breadfruit caused by Uredo artocarpi Arth. - Reported by Stevenson from Porto Rico.

Frenching or mottle leaf - Reported from Florida (unusually prevalent in some orchards) and Porto Rico (very prevalent).

Scaly bark caused by Cladosporium herbarum, var. citricolum Fawcett - Reported from Florida and Porto Rico.

Black melanose, cause unknown - Reported from Florida and Texas.

Sooty mold - Reported as prevalent in Brevard County, Florida.

Leaf spot caused by the parasitic alga Cephaleuros virescens - Reported from Porto Rico.

Pink disease caused by Corticium salmonicolor B. & Br. - Reported from Porto Rico.

Brown rot caused by Pythiacystis citrophthora - Noted in five lots of Italian lemons, four cars averaging about 4% infection, the other car containing 38% decay. One car of California oranges averaged 15% brown rot.

Gray mold, probably due to a species of Botrytis - Reported as causing serious decay in a car of California oranges, complete decay ranged from 50% to 90%, most affected oranges being totally decayed.

PINEAPPLE

Fruit rot caused by Thielaviopsis paradoxa (De Seyn) v. Hohn.

Table II. Losses to pineapple from fruit rot caused by Thielaviopsis paradoxa as shown by inspection of cars by the Bureau of Markets, 1918.

Origin of shipment	: No. of cars inspected	: No. of cars with fruit rot	: Percent affected fruit	: Remarks as to seriousness of decay
Florida	: 4	: 3	: 1 car 100%	: Total decay, a slimy mass.
			: 1 " 12-75%	: 190 crates - 75% total decay,
				: 127 crates - 12-15% total decay
				: and 15-18% decayed spots.
			: 1 " 40%	: Decay in spots which made stock
				: worthless
Cuba	: 17	: 17	: 5 " 40-90%	: From 5 to 20% complete decay in
				: each car, balance in spots.
			: 4 " 10-25%	: Mostly complete decay in each car.
			: 8 " ----	: From 2 to 3 completely decayed
				: fruit in each crate.
Origin unknown	: 7	: 6	: 3 " 60-95%	: 35-40% worthless in 2 cars, 60%
				: worthless in third car.
			: 2 " 18-30%	: Affected fruit worthless.
			: 1 " 8%	: -----
Total	: 28	: 26	: Average 48%	:

According to J. A. Stevenson Thielaviopsis paradoxa occurs practically all over Porto Rico on pineapple and sugar cane. All pineapples become affected if they are allowed to come to full maturity. Since the commercial crop is picked and shipped green, however, by far the greatest loss occurs after the fruit has left the Island. The conditions in the holds of the vessels in which the fruit is shipped, are extremely favorable for infection, with the result that much fruit rots aboard ship and during the later processes of transportation and marketing. As will be seen from the foregoing table the amount of rot in pineapples arriving at northern markets is enormous. A high percentage of decay can be counted on in almost every car.

FIG

Rust caused by Physopella fici (Cast.) Arth. = Uredo fici Cast. was reported from Florida (about as usual) and Texas. J. A. Stevenson also reported it on the few fig trees that are able to exist in Porto Rico and Santo Domingo.

The disease has been reported to the Survey Office in the past as follows - North Carolina (1908), Georgia (1915), Florida (1907, 08, 14, 17), Alabama (1908, 12, 13, 14, 16), Mississippi (1909, 10, 16), Louisiana (1907-1916), Texas (1908, 09, 13-17).

Anthraxnose caused by Glomerella cingulata (Stoneman) Sp. & Von S. was reported from Louisiana (occasional and slight) and Texas.

DISEASES OF NUTS

PECAN

Scab caused by Fusicladium effusum Wint.

Scab was reported as general in South Carolina, Georgia, Florida, Alabama, Mississippi and Louisiana. It seemed to be less serious in Louisiana than in the other states. In South Carolina 50% of the crop was reported injured and 10% lost while in Georgia 1-2% reduction in yield is reported.

In Georgia and Mississippi the Van Dieman variety was reported as most susceptible. Mobile, Delmas (90% infected) and Georgia Grant were also susceptible in Georgia, while Froucher and Pabst were less so.

Rosette (non-parasitic).

Rosette was general and serious in South Carolina and Georgia, and of slight importance locally in Florida, Alabama, Louisiana and Arkansas.

In South Carolina it is said to be the worst pecan disease affecting about 10% of the trees and probably causing a loss of nearly 3%. In Georgia 50% of the trees are often affected in individual groves. The loss for the state, however, is not great.

The relation of the occurrence of the disease to shallow soils underlaid with hard pan is very evident in Georgia. The benefit of using barnyard manure is also clearly shown in numerous instances in that state.

Powdery mildew caused by Microsphaera alni (Wallr.).

Reported from South Carolina, Georgia, Florida and Alabama as common but causing slight or no loss, According to G. L. Peltier the budded varieties seem to be becoming more susceptible to mildew.

Other diseases.

Black pit, an apparently non-parasitic trouble, is reported from Georgia by J. B. Berry on Schly and Delmas varieties. The hull and shell split lengthwise and the kernel turns black and dries up. A 5% loss of the above varieties is estimated in Georgia.

Die back caused by Botryosphaeria berengeriana De Not was reported as less prevalent than usual in Florida.

Winter injury was severe in parts of Mississippi. It is probable that there was considerable in other states also.

WALNUT

Bacterial blight caused by Bacterium juglandis was reported from Oregon by H. P. Barss as follows, - "Rather lighter attacks than usual, but in many plantings this year the disease caused a loss of a quarter or more of the crop. No section of the state seems free of the disease."

One record of its occurrence on English Walnut in Virginia is also at hand.

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Conclusion

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THE PLANT DISEASE BULLETIN

Issued By

The Plant Disease Survey

SUPPLEMENT 2

Summary of Plant Diseases in the United States
in 1918 - Diseases of Field and Vegetable Crops.

May 30, 1919

BUREAU OF PLANT INDUSTRY

UNITED STATES DEPARTMENT OF AGRICULTURE

SUMMARY OF PLANT DISEASES IN THE UNITED STATES IN 1918

II. DISEASES OF FIELD AND VEGETABLE CROPS

Prepared by

R. J. Haskell and G. H. Martin, Jr.

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DISEASES OF POTATO

Late blight caused by Phytophthora infestans (Mont.) DeBary.

Late blight occurred to some extent both on the southern early crop in the spring, and on the northern, late crop in the summer and fall.

It was reported first from Florida where it developed quickly during the last two weeks of April and early May. Special search for it between the dates of March 13 and April 9 failed to reveal its presence but the continued rains that delayed harvest in latter April and early May afforded favorable conditions for developing Phytophthora on the foliage. During harvest the tubers became heavily infected by contact with the diseased tops, and the moist condition in the sacks and barrels after harvest afforded a very favorable opportunity for the development of rot. The result of this late epidemic was that many shipments of Florida potatoes were found to be very badly rotted when arriving at destination. Market inspection records at many of the larger, northern markets showed high percentages of late blight rot coming chiefly from Florida but also from Alabama, Georgia and the Carolinas. Some cars showed as high as 30% rot from Phytophthora. The diagnosis of late blight rot in the field and in shipments of potatoes from the South was somewhat complicated this season by the large amount of slimy soft rot that occurred following injury from excessive soil moisture previous to and during digging. (See slimy soft rot, page 59.)

The reduction in yield to Florida growers from late blight is estimated by H. E. Stevens at about 5% but on account of the great development of the disease on potatoes in shipment the total loss of Florida potatoes will greatly exceed, and will probably at least double, the above estimate.

An unusual circumstance is the report of the appearance of late blight for the first time in Louisiana (May) and Arkansas (May 20). In the latter state it became general, on the tops to such an extent that the crop was reduced about 40-50% (Elliott Pl. Dis. Bul. 2:130, 1918). There was only very little tuber rot however, probably on account of the hot, dry weather of June that followed the killing of the tops in May. The weather of this latter month was unusually favorable for the blighting of the foliage in Arkansas.

In the northern potato belt late blight occurred in three distinct regions; (1) the northeastern area, which includes New England, New York, Pennsylvania, New Jersey, Maryland, Virginia and West Virginia; (2) the Iowa, Minnesota,

Wisconsin area, which involves portions of those three states; and (3) the northwestern area, which includes Oregon and Washington.

In the northeastern area the disease was first noticed in the various states about the middle of July although in New Jersey and Pennsylvania it was noted the latter part of June. At Presque Isle, Maine, it was first observed on plants from infested tubers in an experimental plot as early as July 5, but the first field report from Maine was not until July 17.

In all of these states the disease appeared very threatening in July as an abundance of the fungus developed on the diseased tops in many places. The dry, hot weather commencing in early August, however, checked the development and spread of the fungus and the comparatively dry fall that followed prevented the disease from assuming epidemic proportions.

In general the disease can be said to have been of only slight importance in West Virginia, New Jersey, Pennsylvania, New York, Connecticut and Massachusetts. It was of slightly more consequence in Vermont and New Hampshire and was most severe in Maine. In the latter state many vines were killed and the fungus was present in abundance in practically all fields. Heavy rains previous to digging would have resulted in great losses from blight rot but fortunately the fall was dry up to the time the tops of late varieties were killed by frost (Sept. 10) and the progress of the disease was arrested.

In Michigan, Minnesota and Wisconsin a thorough survey for late blight was maintained during the season. In each of these states there was located a Survey field man who made the search for late blight a major project. The findings in their states and also in Iowa, where a special survey was made during the latter part of the summer, are therefore probably fairly representative of the actual conditions.

In 1917 no blight was found in this north central area except in one county in the northern part of Iowa. None was found in Wisconsin although a special search was made for it. Since home grown seed is mostly used in Wisconsin it was thought that the sources of infection for this year's crop would be few. This proved to be the case as the disease was found in 1918 in rather small amounts and in only two widely separated localities in the northwest and north central part of the state.

The chief region of infestation in the north central area involved northern Iowa and southern Minnesota. Here the disease became evident about the second week in August but the indications were that it had made its initial appearance in July. The weather of August was not especially favorable for blight so that a large proportion of the fields escaped much loss. A considerable amount of rot developed later on, however, so that the total loss, in some places at least, was large. At a number of points in Mitchell County, the principal potato county in the Iowa blight zone, every field had from 10 to 20% rotted tubers.

The occurrence of late blight in this north central area is correlated very closely with the precipitation records for the month of July.

In the northwestern area the disease was reported from Bellingham, Washington (May 3) and points along the coast in Oregon. It is usually of annual occurrence in this region.

Taking everything into consideration the season of 1917 was not what would be called a bad blight year. In the North, the stage was set for a severe epidemic but it failed to develop. In the South, very unusual weather conditions favored the disease so that it was unusually severe on the tubers in Florida and appeared for the first time in Louisiana and Arkansas, causing damage to the tops.

The question as to whether or not it is profitable to spray potatoes with Bordeaux in various parts of the country is an important one and has long been a matter

of uncertainty. In the summer of 1918 the committee on potato spraying, organized by the War Emergency Board of American Plant Pathologists, attempted to get from pathologists in all states a statement of opinion on this subject. Replies were received from about twenty-four states. The detailed results of this work are not yet available but the general conclusions have been kindly supplied by G. R. Bisby, chairman of the potato spraying project committee, and are as follows:

"The results obtained in 1918, supplementing previous data, show that spraying with Bordeaux pays in New York and the northern New England states, though its value is more doubtful in Connecticut, Rhode Island, and New Jersey, especially with early potatoes such as Irish cobbles. In Pennsylvania strikingly favorable results were secured, and Bordeaux is valuable in parts of Virginia. In Wisconsin and Minnesota spraying is said to pay especially in regions of more intensive potato culture, and on certain types of soil. In the central states of Indiana, Kansas, and South Dakota, results are uncertain. In Washington spraying appears unnecessary in the Yakima Valley, for example, where the potato crop is little troubled with diseases, though it is probably advisable in the Puget Sound Region."

Early blight caused by Macrosporium solani E. & M.

Early blight occurred generally throughout the country and was reported from all states with the exception of a few of those in the Great Plains and Rocky Mountain area. It has never been reported to the Survey from Montana, Arizona or Nevada but it probably occurs there.

In general it was not especially destructive and probably did less damage to the potato crop as a whole than usual. In some places, however, especially in parts of New Jersey, Pennsylvania, West Virginia, Georgia and Florida, where heavy losses are often experienced, it was serious and reduced the crop very considerably. Epidemics of early blight frequently occur in the north central states but during 1918 no especially heavy losses were reported.

The weather conditions that favor this disease do not seem to be well understood although a number of collaborators state that high temperatures and abundant moisture are favorable.

Observations made and reported by collaborators and others in 1918 seem to bear out the theory that nearly mature plants, or plants that have become weakened or brought to early maturity through drought, excessive heat, or some other factor, are more susceptible to blight than healthy, vigorously growing plants. Thus in New Jersey the disease is said to have become severe, following a very severe outbreak of tip-burn which was brought on by unfavorable climatic conditions. In Florida the disease was found to be much more severe in the southern part of the state during the latter part of March and early April, than in the northern portion where the severe temperature was lower and the plants younger. The following extract is from the report of A. G. Newhall, Minnesota. "Sept. 2. Early blight is gaining a foothold in about two-thirds of the fields, running up to 90 and 100% in a very few fields of Triumphs and Cobblers. It is not nearly so general on late potatoes and is noticeably lacking in fields of both late and earlies which were planted very late. It seems to be much worse on light, sandy, dry or "quick" soils. I have records on some 64 fields in Pine, Carlton and Kanabec counties seen in the last four days."

Dates of earliest recorded appearance of early blight in 1918.

April.....Louisiana	July 1.....Connecticut
April 4.....Mississippi	July 2.....New Hampshire
April 10.....Georgia	July 10.....Minnesota
April 15.....Tennessee	July 15.....Massachusetts
May.....Oklahoma	July 18.....Pennsylvania
May 20.....Missouri	July (last).....Wisconsin
June (last wk.) Kentucky	August 30.....Vermont
June 27.....New York	

Early varieties are mentioned as most affected in Wisconsin, Minnesota, and Illinois. In Pennsylvania the Carman was reported as very susceptible in Clarion County while in Connecticut Green Mountain was thought to be chiefly affected.

Spraying for early blight is not commonly practiced. Tennessee, Wisconsin, and New York report that it is successful where practiced.

Tip burn (non-parasitic).

Tip burn was reported in 1911 from a majority of the states in the eastern half of the United States. Although it was common in the south it did not materially reduce the crop. In the belt of states from Massachusetts westward to the Dakotas, however, the condition was of unusual severity and caused a great reduction in yield in many places. It was reported as very severe in parts of Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, West Virginia, Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa and North Dakota. In Pennsylvania the affection was so heavy that it is estimated that the early crop was reduced by 40% and the late crop by 15%. In West Virginia it was said to be extremely severe and in Michigan, Wisconsin, and Minnesota it was reported as the most conspicuous and destructive trouble. Collaborators in the states of Wisconsin, West Virginia, and Connecticut mention the presence of insects in connection with the trouble. In many cases early blight was associated with tip burn to such an extent that it was difficult to distinguish between the effects of the two diseases. It will be noted that the two troubles were severe in the New Jersey, Pennsylvania, and West Virginia area.

The following dates indicate the approximate time when the disease first began to be general in various states for which data is available.

1918

May 25 .....Mississippi	July 9 .....Michigan
June 6 .....Pennsylvania	August 1 .....Wisconsin
June (last part).....Kentucky	August 8 .....Connecticut
July 6 .....Minnesota	

Collaborators are unanimous in expressing the opinion that the early crop suffered most. The varieties Triumph in Wisconsin and Minnesota, Early Ohio and Early Rose in Wisconsin, are said to have been most affected while Rural New Yorker in Wisconsin and Dobbles Russett in New York are mentioned as resistant.

Sprayed plants in Wisconsin showed less of the trouble although they were by no means free from it.

Fusarium wilt caused by Fusarium oxysporum Schlecht.

Fusarium wilt was reported from the following states. Massachusetts, New York, Pennsylvania, West Virginia, Kentucky, Tennessee, South Carolina, Texas, Oklahoma, Ohio, Michigan, Wisconsin, Minnesota, North Dakota, Kansas, Montana, Wyoming, Colorado, Utah, Nevada, Washington and Oregon. Undoubtedly the disease occurred, to some extent at least, in practically all states where potatoes are grown. No reports are available in the past records of the Plant Disease Survey, however, to show that the disease has been collected in New Hampshire, Georgia, Mississippi, Illinois, or Arizona although there is little doubt that it occurs in these states.

Within the various states the disease is frequently reported from the valleys and lake regions. Thus in New York it is most serious in the Hudson River Valley, in West Virginia and Ohio in the Ohio Valley, in Minnesota and North Dakota in the Red River Valley, and in California it is said to be prevalent in the San Fernando Valley. In Utah and Nevada it is reported from the lake regions.

This is probably the most destructive potato disease in certain parts of the central and western states and ranks among the first in importance of the potato diseases of the country. It was reported as being rather worse than usual in New York, Minnesota, Utah, and Nevada, and less than normal in Wisconsin and North Dakota. The heaviest losses were incurred as usual in the group of states comprised of the Dakotas, Colorado, Utah, Nevada, Idaho, and California, and in the area covered by Pennsylvania, West Virginia, Ohio, Indiana, and Michigan. It apparently does not cause much damage in the South where early potatoes are grown early in the season or where "second croppers" are produced late in the fall, and it is either absent or of no consequence in the northernmost parts of the country where the growing season is cool. It will be noticed that the states most affected are for the most part along the southern border of the late potato belt where comparatively high summer temperatures prevail at a time when the potato plant is forming tubers.

It is probable that during last season, and in former years, Fusarium wilt has been confused more or less with other diseases, particularly Verticillium wilt, black leg, Rhizoctonia and various malnutrition disturbances.

The following dates show the time of year when Fusarium wilt was first reported in various states during 1917 and 1918.

1917

June 6.....Virginia	July 14.....Utah
June 12.....North Carolina	July 15.....Colorado
June 13.....Tennessee	July (late).....Idaho
June 25.....North Dakota	August 3.....New York
July 3.....Pennsylvania	August 3.....Minnesota
July 7.....Arkansas	August.....Montana
July 10.....Ohio	August (late)....Alabama

1918

July 1.....Tennessee	July 18.....Pennsylvania
July 1.....Kentucky	July.....Wisconsin
July 8.....Colorado	July 24.....New York
July 9.....Michigan	

Frandsen in Nevada mentions Burbank as more susceptible than other varieties.

Verticillium wilt caused by Verticillium albo-atrum Reinke & Berth.

The first survey report of the occurrence of the potato disease caused by Verticillium was from the state of Washington in 1911. Since that time it has been reported from Maine (1913, 1915, 1917, and 1918), New York (1914, 1915), Ohio (1917, 1918), Wisconsin (1918), Utah (1915, 1917), Idaho (1913, 1917), and Oregon (1915-1918). As will be seen from the above, the 1918 reports are from Maine, Ohio, Wisconsin, and Oregon. The earlier reports from Maine showed the disease in the southern and eastern portions of the state but within recent years it is becoming more frequently reported from the Aroostook County section. In New York the fungus has been isolated from vines grown in the western and eastern portions of the state and on Long Island. In Oregon the disease seems to be confined to the western half of the state. The known range in 1918 is shown on the accompanying map. It will be noticed that in general this range of the disease is along the northern portion of the country.

According to present information Verticillium wilt does not seem to be of great economic importance except in western Oregon. Regarding its seriousness in that state in 1918 the following is quoted from a statement of C. E. Owens: "This is one of the most serious diseases of potatoes in Oregon. It is present in nearly all fields, probably averaging 3 to 5% and running as high as 20% in a few cases". H. P. Barss says further: "In the potato seed certification work this year this was encountered more frequently than any other one disease". Although in other sections of the country the disease is not considered as an important one, there are individual farms, particularly in Maine and New York, where it is the cause of serious difficulty. It is probable that this disease is causing more damage than is generally realized but because of its confusion with other troubles, such as Fusarium wilts and blights, tip burn, drought, and malnutrition injury, etc., it has been generally overlooked. It seems also that it is increasing in amount from year to year and so becoming a problem to be reckoned with in the future.

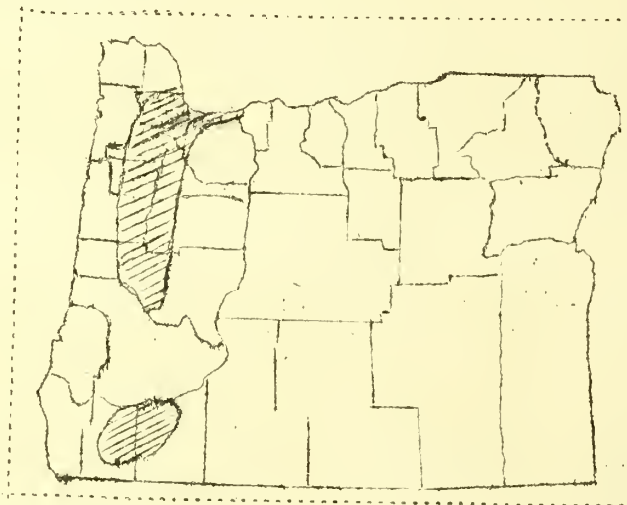


Fig. 4. Regions in Oregon where injury from Verticillium wilt was recorded in 1918. (After map prepared by H. P. Barss and C. E. Owens.)

Bacterial wilt caused by Bacillus solanacearum E.F.S.

This disease occurred in various parts of the south and was reported from South Carolina, Florida, Louisiana, Texas, and Arkansas. Single collections of

specimens were made by collaborators in the states of New Jersey, New York, and Pennsylvania and questionable reports of occurrence came from Ohio and Nevada.

Florida seems to be the only state where the disease was of much importance. In that state it was one of the most destructive potato diseases. In a number of the most important potato counties it was present in almost every field affecting as high as 70% of the plants in some instances. It is estimated that .5-10% in St. Lucie County were affected with a probable reduction in yield of at least 5000 barrels of potatoes. In Flagler County where inspections were made on 700 acres, it is estimated that a 10% loss was sustained, and in Clay County a similar loss is thought to have occurred. Crop rotation in Florida is reported as giving fair results in reducing the disease but many growers object to being obliged to resort to rotation as a control measure. There seems to be a demand for resistant varieties.

Black leg caused by Bacillus atrosepticus Van Hall. or B. phytophthorus Appel. or B. solanisaprus Harrison

Black leg was reported in 1918 from the New England States, New York, New Jersey, Pennsylvania, West Virginia, Ohio, Michigan, Wisconsin, Minnesota, Iowa, North Dakota, Montana, Utah, Washington, Oregon, Tennessee, Georgia, Louisiana, Missouri, New Mexico and Texas. This is the first year that reports of occurrence have come from the last six mentioned states, all of which are in the South.

Black leg is a disease of the northern part of the country. Past records, and also those of the present year, show that it is reported most frequently from, and causes the most damage in, the extreme northern tier of the states. In 1918 the heaviest losses occurred in northern Michigan and Wisconsin, Minnesota, North Dakota, Montana, and Utah. In these states, with the exception of Wisconsin and Montana, the disease is said to have been present in more than the average amounts. In the North Atlantic States, particularly in Maine and New Jersey where the disease has been important in the past, it was less prevalent than usual. According to W. J. Morse, black leg has been becoming gradually less during the past decade in Maine. This is attributed to the more general knowledge of the nature of the disease and the methods of control. In New Jersey M. T. Cook finds that the disease has been on the decrease during the past seven years until this last year only a small amount was evident.

In Michigan E. A. Woodcock visited 328 potato fields in 20 different counties in all parts of the state. The disease was found to be present in 27% of these fields in amounts ranging from a trace to as high as 18% with an average of 1.8%. An average estimate for the total loss in the state is about $\frac{1}{2}\%$.

In Wisconsin W. H. Wright found black leg present in 28 of the many potato fields he visited during the year in amounts ranging from 1% to 25% (average $4\frac{1}{2}\%$ in affected fields).

From Minnesota A. G. Newhall reported as follows concerning the situation in the Red River Valley: "I would say that black leg is getting to be the limiting factor in the production of a good crop in this region. It is apparently worse this year than ever before. Several large acreages were seen with between 20 and 30% and one field was reported with 60% affected plants. Probably Clay County has been hit the hardest which accounts for sixty farmers wanting to get seed plots started."

In North Dakota H. L. Bolley reported the disease as unusually destructive in the Red River Valley, due to the gradual increase of infected seed. Possible overwintering of the causal organism in the soil was mentioned. According to G. R. Hill, black leg was particularly bad on early potatoes in 1918 in Utah. In Davis County 5 to 20% of the early potato vines were killed because of the disease.

The following dates show roughly the time of the year when black leg was first noticed by collaborators in 1917 and 1918.

1917

May 18.....	North Carolina	July 6.....	Minnesota
May 28.....	Virginia	July 6.....	Ohio
June.....	Iowa	July 9.....	Maine
June.....	Wisconsin	July 12.....	Massachusetts
June 10.....	Pennsylvania	July 21.....	New Hampshire
July 3.....	New York		

1918

April.....	Louisiana	July 3.....	Minnesota
May 3.....	Georgia	July 9.....	Michigan
June.....	Tennessee	July 14.....	Pennsylvania
June 1.....	Missouri	July	Wisconsin
June 27.....	Connecticut	July 24.....	New York
July 1.....	Massachusetts		

Roguing and seed selection are generally reported by collaborators as giving the desired results. In the East the general appreciation of better and cleaner seed seems to have resulted in a decrease in the amount of the disease. In the north central section however, no such decrease is evident although much interest is manifested in good seed.

In Minnesota and Wisconsin corrosive sublimate seed treatment gave better results than formaldehyde. Newhall noted in Minnesota that farmers in the Red River Valley who habitually treated their seed with corrosive sublimate had remarkably clean fields with not over one diseased hill in every five or six thousand, while fields from seed that was treated with formaldehyde showed 5 to 15% black leg. He secured other evidence that pointed toward the general superiority of the corrosive sublimate treatment for black leg.

In Michigan Woodcock saw a field where fourteen rows of cut seed showed 7% diseased hills and two thirds of a stand, while forty-four rows of the same seed which was uncut showed only 1% black leg and a perfect stand.

Early Ohio is reported as more susceptible than other varieties from Minnesota.

Stem rot and scurf caused by Corticium vagum B. & C. var. solani Burt
Rhizoctonia solani Kuhn.

Rhizoctonia injury to potatoes was reported from all states but eleven in 1918. It undoubtedly occurred in every state however. The reports for South Carolina, Florida, Mississippi, Louisiana, Arkansas, and Montana are the first ever received from those states. There are no records in the Survey files of the occurrence of the disease in Kentucky, Tennessee, or Illinois.

Reports indicate that the disease was of only slight importance in the South but in some of the more northern states, from Pennsylvania and New York

westward to Washington, heavy losses were sustained. In New York where careful counts were made on about 3200 acres in 18 counties it was estimated that the crop was reduced about 5% on account of missing and diseased hills caused by *Rhizoctonia*. In addition many tubers carried sclerotia. Pennsylvania sustained losses about the same as New York.

In Michigan, where the disease has been a serious trouble for several years, it was common to find 15 to 25% of the hills worthless in fields where no seed treatment was given. The injury took the form of both stunted and missing hills early in the season and aerial tubers and rosette tops later in the year. Although the injury was manifest in about 40% of the fields, and was extremely severe in some places, still the aggregate injury for the state was not great. Counts made in 328 fields in 21 counties showed that only 16% of the fields sustained more than 1% loss.

In Wisconsin this was probably the most important potato disease in 1918. It was generally present everywhere in the state causing irregular stands and small tubers. It was found in 136 fields of the many examined by W. H. Wright in amounts ranging from 1 to 100%, average 14.7% affected hills.

In Iowa, Kansas, Wyoming, Colorado, Utah, Idaho, and Washington it was reported as being general and severe. In most of these states it ranked along with *Fusarium* wilt in importance and in Washington it was even more serious. In this state it was extremely bad and caused losses as high as 50% in some cases. No varietal susceptibility is reported.

Collaborators seem to be agreed that corrosive sublimate as a seed disinfectant is satisfactory and superior to formaldehyde. In a few cases, however, corrosive sublimate used at the commonly recommended strength was reported as giving questionable results.

Malnutrition (non-parasitic)

Malnutrition troubles were reported last season from most of the states along the Atlantic Coast from North Carolina to Maine. Definite reports were received from all the New England states, New York, New Jersey, Pennsylvania and North Carolina. A report from Minnesota also indicates its occurrence for the first time in slight amounts in sandy soil near Grand Rapids, Beltrami County. This is the first record received by the office of the occurrence of this trouble west of Pennsylvania.

For the past few years, and since the scarcity of available potash in commercial fertilizers has existed, potato plants have suffered in regions where fertilizers are usually used and where the soil is naturally somewhat deficient in available potassium. In the season of 1916 Edson and Schreiner¹ reported the condition in numerous eastern fields from Maine to Virginia. In 1917 the same regions were affected.

The trouble seemed to be worst on early potatoes. When these were planted on soils deficient in potash, a great deal of loss often occurred. In 1916 in Maine whole fields went down prematurely with the result that the yield was greatly reduced. In 1917 it was estimated that 10% reduction in yield occurred in the tide water section of Virginia and 5% loss was reported from Vermont. In 1918 Vermont reported 5 to 10% reduction in yield and Connecticut 20% crop injury.

¹Edson, H. A. & Schreiner O. A malnutrition disease of the Irish potato and its control, *Phytopath.* 7 : 70-71. 1917

From reports at hand it appears that the disease was fully as bad in 1916 as any year. In 1917 reports from Maine and Connecticut state that it was not so severe as in 1916. Morse in Maine attributed this decrease to the fact that there was not so much hot, dry weather at the critical period of plant development. In 1918, the disease was less than in the year previous in Maine and Vermont, but in Connecticut, Massachusetts, and New York it was apparently more severe. The situation in Connecticut was very unusual, serious, and difficult to analyze. G. P. Clinton made a special study of the problem and came to the general conclusion that, "Lack of moisture and insufficient plant food, of which potash is one of the factors, were primarily responsible for most of the trouble, rather than fungi, poor seed, or insects (especially lice), all of which have been attributed as the cause". The reason for the decrease in some sections is probably because of the adoption by the farmers of remedial measures such as the use of the better soils for potatoes, the application of larger amounts of barnyard manure, and the purchase of better quality commercial fertilizers.

During the last year considerable has been said about a stem blight of potatoes caused by *Phoma* sp. The Survey has received reports of *Phoma* from the following states: - Maine ("The so-called *Phoma* stem-blight has been recognized in Maine since potash hunger first appeared in 1916. *Phoma* frequently may be found fruiting on plants that have gone down from lack of potash and never appears on similar plants growing along side which have received a potash fertilizer"), New Hampshire, Vermont (Rather commonly collected in potato fields), Massachusetts ("General, while it is not fully determined that *Phoma* was the cause of much of the trouble attributed to it last summer, there is evidence that in restricted areas it was the primary cause of serious loss. It cannot be said with certainty that this disease is of economic importance"), New York (Very common on Long Island and also reported from other places in the state), Pennsylvania.

As is indicated in the above notations it is the general opinion that the occurrence of *Phoma* is tied up with that of malnutrition disturbances. The geographical range of the two diseases seem to be about the same and *Phoma* has been found for the most part on plants suffering from improper nutrition. Such plants are much more susceptible to the attacks of fungi that are normally considered saprophytic. In this connection it is interesting to note that reports of a tuber rot with which *Phoma* was found associated has been reported from Maine and New York in 1918, and from Michigan in 1915. The organism in the latter state was said to be only slightly pathogenic on potato tubers and was different from that described by Melhus from Maine.

Just how parasitic *Phoma* may be still remains to be determined. The evidence however seems to indicate that it is not a primary cause of disease and only attacks plants that are greatly weakened from certain causes.

Dates of first appearance of malnutrition and *Phoma* 1918.

<u>Malnutrition</u>	<u>Phoma</u>
Me. ----- About Aug. 1, 1917 & 1918.	about Aug. 1, 1918.
N. H. -----	Aug. 29, 1918.
Vt. ----- Aug. 1, 1918	Aug. 8, 1918.
Mass. -----	July 10, 1918, July 23, 1917.
Conn. ----- July 6, 1918	about July 6, 1918.
N. Y. ----- July 26, 1917	July 8, 1918.
Pa. -----	June 29, 1918.
Va. ----- Early May 1917.	
Minn. ----- Aug. 8, 1918.	

In Connecticut potatoes of the Rural type, particularly Dobbies Russet, appeared to be less affected by malnutrition than other varieties. Early sorts, such as Irish Cobbler, were worse affected.

Collaborators voice the opinion that the liberal application of manure and the use of the better soils for the potato crop are successful ways to avoid heavy losses from malnutrition troubles.

Mosaic (cause undetermined).

The range of mosaic appears to be limited only by the presence or absence of susceptible varieties. Thus Bliss Triumph has come to be regarded as inseparable from the disease and occurs in practically every field where this variety is planted. Indeed most growers are so accustomed to seeing mosaic diseased plants of this variety that they would be apt to fail to recognize a healthy plant if it could be shown them.

The Green Mountain, which probably ranks second of the commercial varieties in susceptibility, is also fast becoming affected, or at least growers everywhere are experiencing more and more trouble with the disease in this variety. It seemed to be the general opinion at a meeting of pathologists interested in potato mosaic at Buffalo August 16-17, that it was extremely difficult to find fields of Green Mountains free from the disease.

It therefore appears that a map of the United States representing the range of the Bliss Triumph and potatoes of the Green Mountain group would also show in general the range of mosaic.

In 1918 the disease was reported from the northern belt of states extending from coast to coast and including New England, New York, New Jersey, Ohio, Michigan, Wisconsin, Minnesota, North Dakota, Colorado, Montana, Washington, and Oregon; and from the southeastern group of states comprised of Tennessee, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Arkansas, and Texas. From reports of years prior to 1918 the states of Indiana, Illinois, Virginia, West Virginia, and Idaho may be added to the list of those where the disease exists.

It is probable that it will occur in all parts of the country where affected seed is planted. From the reports at hand mosaic seems to be worst in the Gulf Coast States on Triumph where that variety is grown rather extensively for the early market and in New England, northern New York, Long Island, and New Jersey on Green Mountain and on Triumph.

The losses from mosaic are high in the states where the Green Mountain and Triumph varieties are popular, that is, the northeastern and southeastern sections. In Maine in 1916 it was estimated from 10% of the Green Mountain were affected and 50-75% of the Bliss. Since 1916 the disease has apparently not increased greatly in extent or severity. In New York 10% of the Green Mountain were said to be affected in 1915, 10-15% in 1916 and about 25% in 1918. In this state in 1917 it was so severe on certain parts of Long Island that fields of 15 to 30 acres were plowed up and individual farmers lost two to three thousand dollars. In Vermont the disease has not been rated of great importance until the last few years. In 1918 however it was said to be the most serious potato trouble in the state.

Although not many definite figures are available that show the losses for entire states in the South still the many isolated counts that have been made indicate that mosaic presents a very serious problem. In Florida in 1916 50% affected plants were reported in some cases, 30% loss in individual fields in 1917, and 25 to 30% in various regions in 1918. In Alabama 50 to 75% mosaic was observed in several fields in the Mobile section in the spring of 1918.

In this state and in parts of Mississippi it is reported that mosaic is so bad on Bliss Triumph that it is questionable whether or not the variety should be planted. In Arkansas 50% affected plants are reported from some places. In Louisiana it is mentioned as the most prevalent and destructive potato trouble in the Lafourche-Thibadaux region, 90% extreme mosaic reported in a number of fields in this section and 50% from Hammond County. Edgerton estimates 10-20% crop injury and 10% loss for the state. In Texas L. R. Hesler reported 25-50% on Triumph in the vicinity of Austin, 75% bad mosaic at Palestine, 2-5% at Eagle Lake, Colorado County.

It has been estimated that on the average mosaic reduces the yield of potatoes about one-half, thus if 50% of the plants were affected the yield was probably reduced 25%, more or less, depending on the severity of the mosaic.

Practically all states mention Bliss Triumph and varieties of the Green Mountain group as most susceptible. American Giant is reported affected in New Jersey. Peerless (Alabama), Irish Cobbler (Georgia, Maine); and Spaulding Rose (Maine) are mentioned as showing resistance.

Leaf roll (cause undetermined)

Since pathologists do not have a common understanding as to what constitutes true leaf roll the reports that have been received concerning the trouble are necessarily somewhat confusing and not of great value.

The following states have reported a rolling of the leaves in 1918: Maine (Occasional), Vermont (Occasional, loss small, first reported in August), Massachusetts (General, 1% loss, first reported July 8, severe in some fields of Irish Cobblers), Connecticut (Much more common than usual, first reported July 2, variety Gold Coin badly affected), New York (Inspection made in 24 counties on 3,277 acres show 5.5% affected plants, with a probable average loss of 3.8% for fields inspected. This probably represents the loss for the state although, if anything, it is conservative because the fields inspected were among the best, diseased mostly in the blue sprout section of western New York), New Jersey (About the same as last year), Pennsylvania (General and probably more than usual, 50% of crop estimated affected. Dibble's Russet apparently very susceptible as it showed 95% in three different counties, Carman more resistant. Leaf roll is one of the most serious diseases in the state), Tennessee (General, 20% crop injured), South Carolina (Considerable), Georgia (Local, slight, loss small, first reported May 3, Irish Cobbler most affected), Ohio (Seen in a number of fields), Michigan (Apparently not very serious, disease is confused with Fusarium wilt, observed in both Upper and Lower Peninsula), Wisconsin (Slight amount, first reported in July), Minnesota (General, about as usual, probably less than 1% crop injury), Montana (About the average amount, 2-3% crop injury), Washington, Oregon (6% in one field), California (Reported from San Fernando Valley, in two fields average was about 50%).

In addition to the above states reports of leaf rolling have been received from Colorado (1913), Idaho (1913, 1915), Iowa (1916, 1917), Maryland (1915), Nebraska (1913, 1916), and Utah (1915).

Curly dwarf (cause undetermined)

Reports of a curly dwarf disease of potatoes have been received from a number of states. It is probable that in most cases the disease reported has not been

*Report of the conference on Diseases of potato and seed certification 1918: 5. 1918. Murphy, P.A. The economic importance of mosaic of potato Phytopath. 7:72 1917.

the true curly dwarf but dwarf mosaic, or possibly plants that are degenerated from other causes. Reported from Connecticut, Pennsylvania, Louisiana, Arkansas, Ohio, Michigan (Common but not destructive until 1918, several fields in Emmett County showed more than 50% of hills affected, in one place where small seed was used 90% of curly dwarf hills were found. In general the disease was a minor factor in cutting down the yield of the crop), Wisconsin (Scattered, in some fields nearly half of plants may be affected), Minnesota (General, rather less than usual), Iowa (Prevalent but less common than last year), Montana (Occasional plants found affected), Washington.

In addition to the above states what was taken for curly dwarf was reported from the following states in years prior to 1918: California (1917), Florida (1915), Idaho (1913, 1915, 1916), Kansas (1917), Maryland (1915, 1916, 1917), Nebraska (1916, 1917), New Jersey (1915, 1916, 1917), New York (1914, 1915, 1917) and Oregon (1913, 1916, 1917).

Lightning injury (non-parasitic)

Lightning injury was reported in 1918 from New York, New Jersey, Pennsylvania, Michigan and Wisconsin.

Chas. Chupp reported that lightning injury was observed by the members of the department of plant pathology in 4 different fields in the western part of New York. In each case the area affected was about 1 square rod.

L. M. Massey reported plants killed in a circular area about 25 feet in diameter at Egg Harbor City, New Jersey. A witness thought lightning struck there.

Fifteen cases of lightning injury to potatoes were observed in various parts of Pennsylvania last year according to C. R. Orton.

E. F. Woodcock reported as follows from Michigan: "Four cases were observed in the state during the summer. All these were found in the Lower Peninsula and in separate counties. The affected spot in each case did not exceed two rods in diameter and was circular in form. There was no indication that the electricity had followed the rows. Evidence seemed to show that the injury radiated from a common center even though I was not able to locate any central spot where the soil had been disturbed by the bolt. In some cases practically all the plants had been killed, while in others some of the plants remained alive. The injury came so suddenly that the killed plants wilted down immediately without their tissues becoming browned. The stems usually were dry and blackened where the electric current had passed. The stem below the ground appeared to immediately undergo a dry rot. The new tubers, where formed, soon rotted in the ground. In some cases, where the plants were not entirely killed while still prostrate, they began to revive at the tip and this portion would become erect and develop in a normal way."

R. E. Vaughan reported five cases from as many different counties in Wisconsin. This is more than were observed in 1917.

Other earlier reports available in the Survey files are from Maine, Pennsylvania and New York.

W. J. Morse reported two cases, one at Caribou and one at Lagrange, Maine in 1917.

C. R. Orton reported as follows from Pennsylvania: - "An acre of potatoes in Montgomery County was observed to be destroyed from the effects of lightning. A severe electrical shower occurred at the time a portion of the field was flooded for a few hours. The lightning struck a tree at one end of this flooded area and ran down to the ground and over the flooded area. All plants in this area were killed.

The field was visited the following day." "In Armstrong County, Pennsylvania, a field was reported struck on July 21. Plants were killed in an area of about one rod in diameter".

M. F. Barrus and R. J. Haskell reported cases in Wayne and Franklin counties, New York, in 1914. "In each field the plants were all killed in an area of about 2 rods in diameter. In the case in Wayne County there was a shallow sag in part of the field where the bolt struck. The electricity had progressed along this more than in other directions as was shown by dead or affected plants in the low area".

Scab caused by Actinomyces scabies (Thaxter) Gussow.

Scab occurred last year as usual all over the United States. Within the various states it was for the most part general in its range but on account of such influencing factors as extent to which the crop is grown, popularity of seed treatment, character and type of soil, use of barnyard manure, crop rotation, other crops, varieties grown, etc., the disease varied greatly in severity in various sections. Thus in a number of states it is reported as being most serious in the older potato sections. Also in certain counties of states such as New York, Pennsylvania, Wisconsin, and Minnesota, where active seed treatment campaigns have been conducted by county agents, the disease is much less serious than in counties where the matter of seed treatment has not been brought to the farmers' attention.

In general the disease was reported as being about as prevalent as usual but decreases or increases are reported from different states. Minnesota and Pennsylvania report a reduction in scab due to the increased amount of seed treatment, while Massachusetts estimates an increase because of the more general use of barnyard manure as a substitute for commercial fertilizers.

The losses from scab are very great for the United States as a whole. In some states it is considered the most important potato disease. The losses are brought about by reduction in both quantity and quality of marketable tubers.

Table III. Percentages of tubers injured, and the losses sustained, on account of scab during the last two years as estimated by collaborators in various states.

	1917		1918	
	<u>% Injury</u>	<u>% Loss</u>	<u>% Injury</u>	<u>% Loss</u>
Vermont	10-15	5-10	---	---
Massachusetts	---	---	---	3
Connecticut	---	---	---	1-2
New York	---	---	6.4	1
Pennsylvania	11	---	20	5-8
Virginia	35 (Eastern Section)	---	---	---
Kentucky	10	---	---	---
North Carolina	5	---	---	---
South Carolina	5-90	10-20	30	2
Georgia	---	---	10-15	2-3
Florida	0-100	---	---	---
Louisiana	---	---	5-10	5
Texas	1/2	---	1/2	---

Arkansas	10			
Illinois		10-15		
Minnesota		(\$200,000)	1	(\$150,000)
Iowa	3			
Missouri			15	
New Mexico	10-30	1-10		

In Iowa the variety, Early Ohio, which was very badly affected in 1917, was said to be more susceptible than Rural New Yorker. This latter variety in Wisconsin and Russet Burbank in Minnesota are said to show resistance.

Most collaborators state that seed treatment with either formaldehyde or corrosive sublimate is satisfactory when potatoes are placed on clean land. There seems to be a tendency to favor corrosive sublimate as a seed disinfectant probably because of its superiority against other diseases. The following table gives an indication of the amount of seed treatment in various states.

Table IV. Extent of seed treatment of potatoes in various states according to reports of collaborators in 1917 and 1918.

State	Collaborator	Year	Extent of seed treatment.
Maine	W. J. Morse		Rather generally practiced and increasing in popularity through influence of county agents.
Mass.	A. V. Osmun		Almost universally practiced.
Conn.	G. P. Clinton	1917	More interest in seed treatment than ever before.
N. Y.	C. Chupp	1917	Possibly 30% seed treated annually.
Pa.	C. R. Orton	1917	Less scab each year as treatment is quite generally practiced by farmers and commercial growers.
Va.	J. A. McClintock	1917	Only rarely practiced at least in eastern section.
W. Va.	N. J. Giddings	1917	Practiced to a far greater extent than reliable spraying.
Ky.	F. T. McFarland	1917	Little practiced.
N. C.		1917	Many inquiries regarding method received.
Ala.	G. L. Peltier	1917	Most growers said to be treating.
La.	C. W. Edgerton	1917	Growers are beginning to treat.
Ark.	J. A. Elliott	1917	Very little practiced.
Ohio.	A. D. Selby	1917	
Wisc.	R. E. Vaughan	1917	Generally practiced in counties where county agents have made it a special project.
Minn.	Div. Pl. Path.	1918	Considerable increase and consequent reduction in amount of scab.
Iowa	I. E. Melhus	1917	Practiced by only an occasional grower.
Kans.	L. E. Melchers	1917	Not commonly used.
Wyo.	J. F. Groves	1918	Encouraged by county agents but not generally practiced.
Colo.	H. E. Vasey	1917	Practiced by all progressive growers.
Utah	P. J. O'Gara	1917	About 25% of the growers treat seed.
Wash.	F. D. Heald	1917	Practiced by large but not by small growers.
Oreg.	H. P. Barss	1917	Gaining in favor and practice is being extended.
Calif.	J. T. Barrett		The majority of potatoes, however, are not treated.

Powdery scab caused by Spongospora subterranea (Wallr.) Johnson.

It is interesting to note that powdery scab appeared in a private garden at Clemson College, South Carolina. On account of the warm temperature it is probable that the fungus will not flourish in South Carolina.

Wart caused by Chrysophlyctis endobiotica Schilb.

One of the most important events in the pathological field during the past year was the discovery of potato wart for the first time in the United States.

The disease was brought first to the attention of Prof. J. G. Sanders, of the Pennsylvania Department of Agriculture, about the middle of September when he received specimens from Highland, Pennsylvania. A survey made in the vicinity of Highland, from September 23 to October 7, showed the disease to be present in at least twenty-six small mining towns in Luzerne, Schuylkill and Carbon Counties. These places are included in an elliptical area about 12 x 18 miles in size extending from Upper Lehigh in Luzerne County to Beaver Meadows in Schuylkill County.

A somewhat detailed account of the Pennsylvania situation has already been given in this bulletin¹, in other publications².

Silver scurf caused by Spondylocladium atrovirens Harz.

This disease was only reported from New Hampshire, Ohio and Washington in 1918, although records of its occurrence in previous years are at hand from the following states: - Maine, New Hampshire, Massachusetts, Connecticut, New Jersey, Pennsylvania, Delaware, Maryland, Ohio, Michigan, Wisconsin, Minnesota, Iowa, Utah, Idaho, Washington, Oregon and California.

Stem end rot caused by Fusarium eumartii Carpenter.

Pennsylvania reported this disease as principally in the southeastern part of the state. When present it is liable to be more destructive than any other disease of potatoes. First reported July 19, Cumberland County.

Jelly end rot caused by Fusarium radiculicola Wr.

Reported frequently in shipments from Idaho, Washington and Oregon. Field reports have also been received from Pennsylvania where it appeared locally in about the same amount as usual.

(1) Pl. Dis. Bul. 2: 197-199. 1918.

(2) Kunkle, L. O. Wart of potatoes: A disease new to the United States. U. S. Dept. Agr. C., T. & F. C. D. Circ. 6: 1-14. 1919.

Orton, C. R., and Kern, F. D. The potato wart disease. Penn. Agr. Exp. Sta. Bul. 156: 1-16. 1919.

Sanders, J. G. The discovery of European potato wart disease in Pennsylvania. Journ. Econ. Entom. 12: 86-90. 1919.

Black heart (non parasitic).

Reported from Connecticut (Probably more common than usual on potatoes in storage), Maine, New Hampshire, New York (A number of specimens received), Pennsylvania (Local, slight), West Virginia (Severe), Mississippi, Texas, Missouri, and Washington.

Net-necrosis (various causes).

Reports of a so-called net-necrosis have been received from the following states:- Maine (About the same as usual), New Hampshire (Sullivan, Grafton and Belknap Counties, first reported August 3), Vermont (Two to three percent crop injury, first reported in November), Massachusetts (General, 2% loss), Connecticut (One report), Pennsylvania (Local, less than usual), Washington (Reported from King County and said to be caused by low temperatures).

The condition of net-necrosis may result from a number of causes. There is nothing in the above reports to indicate the types of necrosis concerned but it is very probable that more than one factor is responsible. The fact that it is reported only from the extreme northeastern and northwestern parts of the United States seems significant.

Soil rot caused by Cystospora batata Elliott.

Reported on white potatoes from Delaware annually since 1915. In no case was it at all serious. The loss was negligible.

Mushroom root rot caused by Armillaria mellea (Vahl.) Quel.

This fungus has been reported to the Survey several times during the last few years. In no case did it cause any special damage, less than 1% crop injury in all cases and in most instances it was so rare as to be considered a curiosity. Four states have reported mushroom root rot as follows: - Michigan (1915), Wisconsin (1917), Washington (1917, 1918), and Oregon (1915, 1916, 1917).

Unusual tuber formation.

Contributed by Prof. C. W. Waid.- "In Michigan for the last two or three years, we have been finding a good many cases where tubers have formed on the seed piece without any top growth whatever. In some fields as high as 50% of the seed pieces developed in this manner. In most cases, the percentage is much smaller, however. There apparently is some connection between this unusual development and another form of tuber growth which is very abnormal, namely, the formation of tubers as a part of the stem. At least three fields which were inspected this season showed a considerable percentage of this kind of growth. As a rule, there is but one potato stalk in a hill having this sort of tuber formation and only one tuber as a rule forms in a stalk. However, in a few cases two or even three tubers have been found as a part of a single slender stalk."

Streak (Cause undetermined).

Streak was commonly reported by field inspectors in 1918 from New York where it has been under observation for a number of years. There seems to be more than one type of streak. In Maine a disease of this nature has been observed in recent years and is being investigated at the United States Department of Agriculture field laboratory at Presque Isle.

In July, 1915, a streak disease was reported by O. A. Pratt from Idaho as general but apparently doing little or no damage, and in 1916 cases were observed and reported in eastern Virginia and northern Minnesota.

Spindling sprout (non parasitic).

Reported to the Survey as follows:- 1916, Ohio, Idaho, Washington; 1917, Pennsylvania (Mercer County), Maryland (Prevalent, 4% loss in state), Minnesota (Anoka County), Washington (King, Washington, and Benton Counties), California (Few cases); 1918, Connecticut (Unusually conspicuous, serious in a number of fields), Ohio, Washington (Pierce, Yakima and Whitman Counties), California (San Fernando Valley).

Sclerotium blight caused by Sclerotium rolfsii Sacc.

Occurred throughout the southern states. Definite reports came from Louisiana (Common, 1-5% injury in different fields, possibly 1% loss, first reported in May) and Texas (Traces found in every field examined in the vicinity of Brownsville, San Benito, Harlingen).

Chlorosis (probably non parasitic):

Reported from Yakima and Benton Counties, Washington. It was also reported from these same counties in 1916.

Stem blight caused by Phoma sp.

(See malnutrition, page 50).

Slimy soft rot probably caused by Bacillus carotovorus Jones.

In the inspection of potatoes at the various markets during the season of 1918 slimy soft rot was found to be present in shipments from the following states:- Alabama, Arkansas, California, Florida, Georgia, Illinois, Indiana, Louisiana, Maryland, Michigan, Mississippi, Missouri, Nebraska, New Jersey, North Carolina, Ohio, Oklahoma, Pennsylvania, South Carolina, Tennessee, Texas, and Virginia.

It is thought that organisms of the Bacillus carotovorus type attack potatoes under unusual conditions, such as water-soaked soil with high temperatures, the heavy rains at harvesting time in the South probably being responsible for the heavy infection with the resulting loss in transportation. It will be seen that the highest percentages of decay were found in shipments of south-

ern grown stock. The largest number of cars of potatoes originated in Florida, Texas, and Louisiana. Of the 51 cars shipped from Louisiana, 15 cars ranged from 22 to 90% and the remaining 36 cars averaged about 12% decay. The potatoes shipped from the other southern states mentioned averaged about the same percentage of decay as those from Louisiana, while the stock grown in the more northern and western states averaged 3-10% decay in most instances, an occasional car noted with a somewhat higher percentage.

TOMATO

Septoria blight caused by Septoria lycopersici Speg.

During 1918 blight was very severe along the Atlantic Coast states from New Jersey to Georgia and also in the Ohio Valley. It was found in Vermont, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, West Virginia, Tennessee, Kentucky, North Carolina, South Carolina, Georgia, Alabama, Mississippi, Texas, Oklahoma, Arkansas, Ohio, Indiana, Michigan, Wisconsin, Minnesota, Missouri, Nebraska, Kansas, Colorado, and New Mexico. It was reported not present in Massachusetts, Louisiana, and Montana. Septoria blight has been reported at previous times from all the states except Montana, Wyoming, Arizona, Utah, Nevada and Idaho.

In South Carolina and Minnesota there was more than the usual amount, while in Connecticut, New Jersey, Pennsylvania, Delaware, West Virginia, Ohio, and Wisconsin there was less. In Virginia it was severe as usual.

In New York Septoria blight was abundant, and in a few cases the vines were an entire loss because of this disease. In New Jersey it was practically impossible to find a single plant free from the disease in many fields and frequently every leaf on the plant bore one or more spots. In Delaware it was found in many fields in every district. The foliage was destroyed in three weeks from the time the ripening period commenced. Depending on the resistance of the variety and the fertility of the soil, the damage for Delaware varied from 25% to 75% loss with an approximate average of 35%. In Virginia it was the most prevalent and generally destructive disease of the tomato crop. In North Carolina it caused premature drying of vines in many patches. In Georgia there was often a 100% injury in individual gardens. In Alabama many fields were defoliated.

Reports from New York, Wisconsin, and Minnesota mentioned the fact that the lower leaves were almost always attacked the worst. In Texas it attacked the flowers, causing a considerable dropping of the blooms.

Favorable weather conditions were reported from Virginia (Abundant rainfall), South Carolina, Georgia (Occasional showers in northern part of state), Oklahoma, Minnesota, Colorado (Frequent rains). Weather not favorable was experienced in New Jersey (Dry), Delaware (Drought from May to August 15 in the vicinity of Viola), Wisconsin (Dry).

Dates of first appearance according to collaborators;

1917

Early spring..... Tennessee
June..... Maryland
June 4..... New York

July 15..... Virginia
July 16..... Ohio
August..... Pennsylvania

1917 (continued)

June 24.....	Minnesota	Aug. 17.....	Maine
July.....	Oklahoma	Aug. 22.....	New Hampshire
July.....	Wisconsin		

1918

May 20.....	Virginia	July 1.....	Missouri
June.....	Oklahoma	July 1.....	Kansas
June 6.....	Mississippi	July 23.....	New York
June 20.....	Georgia	Aug. 6.....	Pennsylvania
June 30.....	Minnesota	Sept. 15.....	Vermont
July.....	Wisconsin		

Varietal susceptibility was noted in Pennsylvania where the variety Magnus seemed most susceptible in Luzerne County. In Delaware the Norton tomato was distributed by the Delaware Experiment Station in cooperation with the Bureau of Plant Industry. According to T. F. Manns, the foliage of this strain stood up well but it was found to be late in setting its fruit. The Greater Baltimore strain ripened more fruit in three weeks than did Norton in five weeks. The demonstration plots were transplanted the first week in June. The farmers like a variety which may be transplanted the last week in May and continued until the third week in June; a variety which will ripen from the middle of August to the last of September so that tomato land may be used for winter wheat or, in the southern part of the state, sowed to crimson clover and wheat. In New Jersey and Minnesota it was more serious on early tomatoes, Earliana being especially affected.

Spraying as a means of control is apparently effective as shown by the results obtained in various states where it was tried or practiced. In New Jersey striking contrasts were noticed between sprayed and unsprayed vines in demonstration plots. In Delaware spraying was probably practiced commercially only on one farm in the state (near Seaford). The owner claimed results. At Viola experiments were made with the following sprays:- (1) Bordeaux (4-4-50), three sprayings; (2) resin fish oil soap bordeaux; (3) resin fish oil soap copper sulphate. On account of the existing drought satisfactory and accurate results were not obtainable. In the vicinity of Newark where there had been some summer rains the spraying showed up to advantage. In Maryland extensive spraying projects on the eastern shore gave fairly good control. In Virginia a field sprayed once showed marked difference between sprayed and check plots. In Georgia and Alabama Bordeaux held the disease in check when used. Little or no control is said to be practiced in South Carolina, Texas, Wisconsin and Minnesota.

Fusarium wilt caused by *Fusarium lycopersici* Sacc.

Fusarium wilt was reported as occurring in greenhouses in Massachusetts, New York, and Pennsylvania, and out-of-doors in Connecticut, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, West Virginia, Tennessee, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Texas, Oklahoma, Arkansas, Ohio, Missouri, Nevada and Kansas. In Wisconsin plants were artificially infected in the field and later partially recovered. Reports of *Fusarium lycopersici* were also received from Colorado, Utah and Nevada, but because of the possible confusion with some of the western blights

it is preferred to keep these reports separate until it is definitely established that lycopersici is the real cause. As will be noticed wilt is largely southern in its range although it causes serious losses as far north as New Jersey and Ohio. Its range, although wider, is somewhat coincident with that of bacterial wilt and, as the two diseases are much alike and are often present in the same fields, difficulty is experienced sometimes in distinguishing clearly between the two. The area of infested land seems to be increasing annually in many states.

In 1918 the disease was about as prevalent as usual although in Tennessee it was reported as less than normal. The greatest losses occurred in the southern Atlantic and Gulf Coast states and in Tennessee. Estimates are not available for the states bordering the Ohio River, but it is suspected as having been bad there. Losses by states are given elsewhere in this volume of the Plant Disease Bulletin. In Delaware, in the vicinity of Columbia, T. F. Manns made counts of infected plants. It was found that 10 to 25% of the plants were so badly diseased that they matured practically no fruit. The average for the state has been placed at 9%. In Georgia, Mississippi, Alabama, and Tennessee this was reported as the most important tomato disease.

Dates when wilt was reported as being first observed,

1917

April 24 (greenhouse) Massachusetts	July 1.....	Delaware
May..... Louisiana	July 12.....	Virginia
May 20..... Mississippi	July 14.....	Pennsylvania
June 15..... Tennessee	July.....	West Virginia
June 15..... Ohio.	July.....	Arkansas
June..... New Jersey	Aug. 1.....	North Carolina

1918

April 8 (greenhouse). New York	June 1.....	Tennessee
May..... Louisiana	June 11.....	Pennsylvania
May 25..... Mississippi	July 2.....	Connecticut
June 1..... Georgia	July 15.....	Virginia

The resistant variety distributed by the Department of Agriculture was reported as giving very satisfactory results by most states where used. For Georgia, where several pounds of seed were planted, J. B. Berry reported as follows: "The seed was distributed among some twenty-five agents and projects usually showed good results. In several cases the Norton was planted with other varieties and all but the resistant were destroyed. It was also noted that the wilt resistant stood the drought better than any other variety." Peltier, in Alabama, reported that the variety from the United States Department of Agriculture held up very finely. In Maryland about 1000 acres of resistant strains were grown with good results. In Tennessee the Tennessee resistant and Globe were used successfully. In Virginia Norton was very resistant, while Brimmer and Bonny Best were susceptible. In Pennsylvania Earliana was reported particularly susceptible. In Ohio progress was reported in breeding resistant strains of Bonny Best and Globe in cooperation with the United States Department of Agriculture.

Rotation of crops seems to be recommended in some states, although it is reported as not being very satisfactory as a means of control. One case was observed in Texas where an 8-10 year rotation was apparently successful, but many other fields were observed that showed no gain from a 4-5 year rotation.

Western blights caused by Fusarium spp.

Various blights of tomatoes, some of which may or may not be the same, have been reported from the western states. A disease thought to be caused by Fusarium lycopersici, was said to have caused heavy losses in certain early tomato sections of Utah. Some fields showed as high as 20% infection. In Nevada 5% loss from a similar trouble was estimated. The most damage was in the western portion bordering California. In New Mexico a blight that has all the characteristics of the disease that is reported from the extreme northwest, was reported as prevalent and very destructive. In many fields 50-100% of the plants were diseased. The fact that the Department of Agriculture wilt resistant variety, which was so successful in states where Fusarium lycopersici is abundant, did not stand up under the New Mexican disease, is added proof that the trouble in that state is not the true Fusarium wilt.

In California a wilt disease, thought to be caused by Fusarium was reported in the vicinity of Hayward and San Jose causing losses of from 60 to 90% in large fields. Whether or not this is the same as the so-called summer blight of California is not certain. Summer blight, however, was reported by D. G. Milbrath as very serious in the tomato section of Moneta, Los Angeles County, California, and common throughout central California in general.

The yellow blight described by Humphrey (Wash. Agr. Exp. Sta. Bul. 115: 1-21, 1914) was reported as serious all along the tomato growing region of the Columbia Basin, Oregon, and was said to be very prevalent across the boundary in Washington.

Early blight caused by Macrosporium solani, E. & M.

Early blight was reported from New Hampshire, Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Delaware, West Virginia, Virginia, Kentucky, Tennessee, South Carolina, Florida, Mississippi, Louisiana, Texas, Oklahoma, Ohio, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, Kansas and New Mexico. As will be noticed this was particularly an eastern disease and reports of past years show that it has been more abundant in the southern and eastern parts of the country, particularly the southeastern portion. In 1918 it was most severe in Florida and Louisiana, where many early tomatoes are grown. It was also reported as very bad in parts of Tennessee, Kentucky, Ohio, West Virginia and New Jersey.

The losses were heavy in some of the southern states. In Florida it is estimated that at least 30% of the crop was lost previous to shipment. L. R. Hesler reported the disease as exceedingly prevalent and destructive both in the East and West coast regions. It occurred in all fields, causing a severe spotting and premature dying of the foliage, especially the lower leaves. Growers and others agreed that at least 20% of the fruits were culled out at the pack-

ing houses on account of blight lesions, or "nail head spot" as it is commonly called. In addition to this loss many tomatoes were not picked because of the severe spotting of the fruit. G. K. K. Link reported the crop in many places in Florida ruined by early blight. One firm had to discard 40% of all tomatoes delivered at the packing house, mostly on account of "nail head spot". In Louisiana Mr. Neal reported that losses of 40-50% were observed in every field examined in Jefferson and St. Bernard Parishes where there are about two thousand truckers. The quality of tomatoes in these fields was said to be poor because of premature death of the vines.

In addition to the heavy losses that occurred in the field, large amounts of "nail head spot" were reported in shipments of early southern tomatoes to northern markets. The following table gives an indication of the amount of disease found by inspectors of the Bureau of Markets:

Table V. Extent of "nail head spot" as found by inspection of shipments at various northern markets.

Origin of shipment	No. of cars inspected	No. of cars with nail head	Percent affected fruit	Remarks as to seriousness of disease
California	31	2	1 car 6%	
Florida	108	85	1 " 23%	Not extending deeply into fruit.
			21 cars 30% up	More than half of decay in each car bad.
			9 " 20-30%	Most cars with 1 to 10 spots, some cars as high as 20 spots each fruit.
			27 " 10-20%	Averaging 1-5 spots to each fruit.
			22 " 2-10%	Mostly slight, a few spots each.
			6 " 1-2%	Occasional spot.
Georgia	1	1	15%	From 2-10 spots on each tomato.
Rhode Island	1	1	3%	
Tennessee	16	1	2.5%	Slight.
Mexico	11	1	----	A small amount of slight decay.
Origin unknown	7	1	8.5%	From 6-15 spots on each affected fruit, one-fourth inch in size.
Total	175	92	Average 12-15%	

Spotting of both fruit and foliage is said to be common in the South and up the coast to New Jersey but in the more northern states, of those reporting, the injury seems to be confined chiefly to the foliage. Clinton in Connecticut reported a spotting of the fruit as having been observed for the first time in the state. The disease was reported by collaborators as first appearing in 1917 and 1918 on the following dates:

1917

Jan..... Florida
 March..... Mississippi
 July 1..... Delaware
 Aug. 3..... Ohio

Aug. 4..... New York
 Aug. 20..... Minnesota
 Oct. 1..... Pennsylvania

1918

May 30..... Tennessee
 June 15..... Virginia
 July 1..... Missouri
 July 5..... Massachusetts

July 28..... Penneyslvania
 Aug. 3..... New York
 Aug. 12..... Connecticut

The disease was reported on Earliana and Early Belle in Connecticut, Earliana and June Pink in Louisiana, Ponderosa in Pennsylvania.

Bacterial blight caused by Bacterium solanacearum E.F.S.

Judging from the reports at hand bacterial blight was about as prevalent in 1918 as in 1917 but was apparently more widely distributed than in the year 1914, 1915 or 1916. It was reported from Virginia, West Virginia, Tennessee, North Carolina, South Carolina, Georgia, Florida, Porto Rico, Texas, Arkansas, Ohio and Colorado. It was reported as not present in Connecticut, New Jersey, Maryland, Alabama, Wisconsin, Missouri, Kansas, Kentucky, Louisiana, Oklahoma, Montana and Washington.

The greatest injury seemed to have taken place in the Carolinas and adjacent states. In Richmond County, North Carolina, some growers state that they can not produce the crop profitably on account of the disease. In South Carolina, it is reckoned as by far the most important tomato trouble. This is also the case in Porto Rico. Estimated losses of 1% or more are also reported from Georgia, Florida, Virginia, Tennessee and Texas. In the other states it appears to be of only slight importance.

Blossom end rot (non parasitic).

Blossom end rot seems to have been unusually severe in 1918. It appeared in thirty-one states from the Atlantic to the Pacific Coast, from the northern to the southern boundary. The trouble was general and very severe in New Jersey, Pennsylvania, Maryland, West Virginia, Kentucky (Epidemic), Florida, Alabama, Mississippi, Louisiana, Texas, Arkansas, Ohio, Missouri, Nevada and Oregon. Reports were sent in from the following states for the first time, although its occurrence in these states is by no means new: New Hampshire (Local, moderately severe), Oklahoma (Local and very slight), Illinois (Local, moderately severe), Nevada (General and very severe). The only states in which tomatoes were grown and which have not reported blossom end rot are North Dakota, South Dakota, Montana, New Mexico and Idaho.

The losses were heavy in many states. In New York the Chatauqua district was so hard hit that the growers insisted that plant pathologists take some action. In Niagara County, New York, the growers also asked for assistance in combating the trouble. In Tennessee the crop was unusually free from the disease during 1918. In Alabama considerable loss occurred. In Mississippi blossom end rot was very common and the most important tomato disease in the large fields about Crystal Springs. In Texas it was second in importance to blossom drop. In Ohio it was more serious than ever before known. In Michigan total losses were experienced in some fields in the southern part of the state.

Table VI. Injury and losses to tomatoes from blossom end rot as reported by collaborators, 1918.

<u>State</u>	<u>Percent fruit injury</u>	<u>Percent loss</u>
Vermont	2 - 5%	2 - %
Massachusetts	---	possibly 1%
New York	5%	---
Pennsylvania	---	11%
Virginia	Very slight	Very little
Kentucky	50%	35 - 75%
Georgia	100% (locally)	15 - 20%
Mississippi	---	30 - 34%
Louisiana	---	probably 16%
Texas	10%	---
Oklahoma	1/2%	---
Arkansas	15%	20% (?)
Wisconsin	trace	trace
Missouri	10%	---
Kansas	100% (local)	---
Arkansas	1%	---
Nevada	10%	5%
California	---	15% (local)

Several possible factors were presented by various states as perhaps having influence in bringing about blossom end rot. The effect of moisture was noticed in Georgia during the growing season when the weather was warm with occasional showers; in Alabama it was extremely dry during May and June, and in Ohio the disease was thought to have been associated with drought conditions. Insufficient soil moisture in Oregon was connected with the appearance of the disease. It was considered an irrigation problem in Utah. In Massachusetts the trouble was severe where highly nitrogenous fertilizers were used. In New York blossom end rot was worse when the vines were tied up and a top dressing of nitrate of soda used than when the vines were not cared for. In Georgia it was greater when the vines were supported than when they were on the ground. In Mississippi, J. M. Beal examined one field of 4 1/2 acres of clay loam soil which had been fertilized in 1917 with stable manure, and the tomato plants given good cultivation, staked and pruned. The weather conditions had been ideal. This field showed 80-85% infection. Although this field was worse than any of the others examined, all showed over 20%. In other fields where crops were grown under different cultural and fertilization methods the tomatoes were equally affected. The effect of sudden weather changes was observed in Florida.

The dates of earliest recorded appearance were as follows:

May.....	Louisiana	July.....	Oklahoma
May 25.....	Pennsylvania	July 3.....	New York
June 1.....	Georgia	July 29.....	Kansas
June 1.....	Missouri	Aug.....	Wisconsin
June 6.....	Mississippi	Aug. 8.....	New Hampshire
June 20.....	Virginia	Sept. 10.....	Vermont

Bonny Best and Earliana were more resistant than Ponderosa, Stone, and New Globe (badly affected) under the same conditions in Pennsylvania. In Virginia Bonny Best was also more resistant than Stone but in Illinois the disease was reported to be prevalent on Bonny Best. All varieties were affected in Kentucky.

Late blight caused by Phytophthora infestans (Mont.) De Bary.

Late blight was apparently less prevalent than in 1917. It was reported from Delaware, Virginia, West Virginia, and Ohio.

In Delaware it was local in the vicinity of Rehoboth where two fields were badly blighted. In parts of Virginia it was prevalent in almost every home garden except a few that had been sprayed. In West Virginia it was moderately severe in Tucker and Fayette Counties and of slight importance in Randolph and Greenbrier counties. In Oregon the situation is given by H. P. Barss as follows:

"The presence of this disease in Multnomah County, while not reported in 1917 nor 1918, was noted in 1916 and in previous years. It has sometimes been quite abundant in the early fall in this section. The unusual absence of any considerable amount of cool and rainy or foggy weather in this region during the past two seasons has probably prevented its appearance to any extent of late, but there is no doubt of its positive presence within the state. No cross inoculations between tomato and potato have been attempted in the state, so there exists some little reason for speculation as to whether this strain which appears morphologically very like the potato mildew is actually identical." 12/10/18

Leaf mold caused by Cladosporium fulvum. Cke.

This disease was apparently much less severe and prevalent than in 1917. It was generally found in greenhouses although also in the field. It was reported in Massachusetts, New York, (Considerable injury) Pennsylvania, South Carolina, Florida, Porto Rico, Oklahoma, Ohio, Iowa (Often limiting factor in commercial greenhouses where control methods are not practiced), Minnesota (Yield reduced 30% in Hennepin county), Nebraska, and Oregon (One report of serious damage to greenhouse tomatoes in Coast Region).

Buck eye rot caused by Phytophthora terrestris. Sherb.

This disease has been reported at various times during recent years from the southern states of Florida, Louisiana, Arkansas, and Texas, also Porto Rico. In 1918 reports were received from all these states. Judging from these reports the disease was worst in Florida. In Louisiana it was said to be severe on the lower fruits in the market gardens in the vicinity of New Orleans. For the state as a whole it was not serious, however. In Porto Rico the rot is common and attacks other vegetables, especially beans. The rot was reported in shipments of tomatoes from Florida and Texas. Inspection of seven cars of Florida tomatoes in northern markets in the spring of 1918 showed an average of from 3 to 6% buck eye rot and inspection of 5 cars of Texas tomatoes showed 2 cars with 14 and 18% disease

Grand Rapids disease caused by Arplanobacter michiganensis E. F. S.

This disease was first reported by Dr. E. F. Smith in the summer of 1909 as prevalent and doing considerable damage in the vicinity of Grand Rapids, Michigan. He also reported it as occurring on tomatoes in 1912 in a greenhouse at Arkport, western New York, and expressed the opinion that it was prevalent in other parts of the United States. Since 1912 it has been collected at various times in Michigan and specimens from New York and Indiana have been seen by the writers.

The disease was reported from Pennsylvania in 1918. It is stated that 50% loss resulted in two fields, one in Erie County and the other in Luzerne County, during that year. Chalk's Early Jewel and Earliana were affected, the latter more seriously. Red Rock was diseased to a slighter extent.

This trouble is not well known and is undoubtedly confused with other tomato diseases so that authentic survey data are not readily obtainable.

Mosaic (cause undetermined)

Mosaic was found in New York, New Jersey, Pennsylvania, Delaware, Georgia, Florida, Louisiana, Ohio, Illinois, Wisconsin, Minnesota, Missouri, Kansas, and Oregon. Reporting the disease for the first time were Georgia, Louisiana, Wisconsin, Missouri, Oregon, and California.

In New York there was considerable locally. In New Jersey the disease followed a bad infestation of aphids during July and early August, but there appeared no actual reduction in yield. In Pennsylvania the fern leaf stage was about the only dangerous form of the disease found in the fields. It was general but less prevalent than in 1917 and caused a 2-3% loss. In Delaware it was quite common in the early summer but apparently was not so bad as usual. In Florida all stages of the trouble were found on the foliage. Though second to early blight in prevalence its damage was negligible. In Louisiana it was very common causing considerable injury. In Ohio, Illinois, Wisconsin, Minnesota, and Missouri it was unimportant. In Kansas, mosaic was general and severe. In Oregon it was general, very severe, and worse than ever before.

A few plants in a greenhouse at Cudahy, Wisconsin, were reported to have shown marked resistance to the disease. The grower felt that the trouble was induced by unfavorable growing conditions while the plants were young.

Soft rot caused by bacteria.

Rather high percentages of decay were noted in eighteen cars of tomatoes from various states. Three of these cars were shipped from Florida in June, the decay in one car was slight, and another shipment had 22% of contents worthless from soft bacterial decay. In one small lot of eleven crates the tomatoes had sunk to half the depth of the baskets.

Two cars of Mississippi tomatoes showed rather heavy decay, one car containing 22% of worthless stock, the other car having 15% of fruit affected.

Seven cars of Pennsylvania tomatoes were inspected in August and were very badly diseased, decay ranging from 63% to 82%.

One car of tomatoes from Rhode Island was noted as having some bacterial decay with other rots but no definite report was made as to the exact percentage of any of these rots.

Three cars of Tennessee tomatoes showed varying amounts of bacterial soft rot, one car inspected at Atlanta in July averaging 33% soft rot, the other two cars inspected at northern markets ranging from 5% to 11% decay.

Cuban tomatoes were somewhat infected, one car showing 5% to 7% decay, the other car 15-20%.

Phoma rot caused by Phoma destructiva Plowr.

Table VII. Amount of Phoma rot as shown by market inspection at the various northern markets during the season of 1918.

Origin of shipment	No. of cars inspected	No. of cars with Phoma	Percent affected fruit	Remarks as to seriousness of decay
California	31	4	2 cars, 3-4% 1 car, 25% 1 " 80%	Present in spots. Decay in cracks around stem end. Ranging from small spots to total decay.
Florida	108	62	15 cars 20-50% 21 cars 10-17% 26 " 5-8%	Bad decay, some complete decay. Mostly in spots, a few cases bad. From 3 to 8 spots to specimen.
Mississippi	12	2	2 " 5%	
Missouri	4	1	Occasional	Slight.
Rhode Island	1	1	----	Combined with other diseases.
Tennessee	16	4	4 cars 5%	Various stages, from 0 to 20%.
Texas	23	1	1 car 14%	From slight to 35%.
Cuba	5	1	1 car 20%	10% bad decay, 10% in spots.
Mexico	11	8	3 cars 3-6% 2 " 10-20% 1 car 40-45%	In spots. Small to large spots.
Origin unknown	7	3	1 " 50% 1 " 26% 1 " 3%	Affecting half of fruit. In spots. From 6 to 15 small spots each.
Total	218	87	Average 15%	

Leak or soft rot probably caused by Rhizopus nigricans Ehr.

Leak or watery soft rot seriously affected tomatoes in twenty-six cars from Florida. Several cars averaged as high as 20-34% but most cars ranged from 5 to 10%. In all cases the affected tomatoes were totally decayed.

Three cars of Mississippi tomatoes were found to be affected, two of them averaging from 19% to 26% decay, the other car 2%.

Missouri tomatoes averaged 7% soft rot. One car from Tennessee showed from 25 to 30% Rhizopus rot. Small amounts of leak were found in four cars of Texas tomatoes, but in no case was there more than 5% decay.

Soil Rot caused by Rhizoctonia solani Kuhn.

Severe soil rot infection was noted in three cars of Florida tomatoes, 20% and 22% infection being found in 2 cars. In the other car only 3% soil rot was present.

Rot caused by Sclerotinia libertiana Fekl.

This decay was found to be present in only two cars of tomatoes from Florida, averaging 4% and 10% respectively. The affected tomatoes were soft and watery.

BEAN

Bacterial blight caused by Bacterium phaseoli, E.F.S.

Bacterial blight was reported from all but the following states in 1918: Delaware, Maryland, North Carolina, Alabama, Mississippi, Iowa, South Dakota, Nebraska, Wyoming, Utah, Nevada, Idaho, Washington, and California. This does not mean that the disease did not occur in the states named. It probably was present in most cases but no reports of occurrence were received. In past years blight has been reported to the Survey from all states except Wyoming, Nevada, Utah, and Kentucky. The disease was less prevalent than in 1917 in Minnesota, Oregon, Vermont, and Oklahoma and more prevalent in Colorado (where it was exceptionally severe), Louisiana, Tennessee, and Maine.

The highest percentage of loss occurred in the following states in order of importance: Colorado, Tennessee, Louisiana, New York, Pennsylvania, Virginia, Texas, Minnesota, and North Dakota. In Colorado, the fourth largest dry bean producing state, the disease was epidemic in the bean districts where 40-60% of the crop was injured with a decrease in yield of about 35%. In New York, which produced about 1,660,000 bushels of dry beans in 1918, or nearly one eleventh of the total yield in the United States, it is estimated that from 5 to 10%, with a possible average of 7%, or about 125,000 bushels of beans were lost. In Montana this disease is said to have been the most important bean trouble.

The blight is said to have affected principally the leaves and stems in Massachusetts, New York, Pennsylvania, Virginia, Michigan, Minnesota, and Texas. In other states, such as Colorado, Louisiana, West Virginia, and Wisconsin, it was equally severe on the pods. From Montana, Colorado, Oregon, and New York considerable trouble with stem girdling was reported. In the first two named states much loss was caused by the breaking over of the plants because of deep lesions at the point of attachment of the cotyledons. In Connecticut a wilt of seedlings is reported which may possibly be caused by the blight organism.

Dates when bacterial blight was first observed by collaborators in 1917 and 1918.

1917

April..... Louisiana
April..... Maryland
May..... Alabama

July..... Arkansas
July..... Wisconsin
July..... Colorado

1917 (continued)

June.....	Oklahoma	July.....	Oregon
June 1.....	Delaware	July 9.....	New Hampshire
June 2.....	Minnesota	July 15.....	New York
June 5.....	Vermont	Aug.....	Pennsylvania
June 13.....	Tennessee	Aug. 1.....	Michigan
June 25.....	Massachusetts		

1918

April.....	Texas	July 1.....	New York
April (last)...	Louisiana	July 2.....	New Hampshire
June 2.....	Minnesota	July 25.....	Colorado
June 4.....	Kansas	July 25.....	Pennsylvania
June 10.....	Tennessee	July.....	Wisconsin
June 20.....	Virginia	Aug. 24.....	Georgia
July.....	Oklahoma		

The varieties Navy Pea in Minnesota and Tennessee and Red Kidney in New York, were reported as especially susceptible, while Pinto beans in Colorado and the variety of shell bean known as Great Northern in Montana were reported as resistant. According to reports the latter variety has never been found affected in Montana.

Anthrachnose caused by Colletotrichum lindemuthianum (Sacc. & Magn.) Bri. & Cav.

Taking the country as a whole anthrachnose was less severe in 1918 than in 1917 or 1915 which were anthrachnose years. However it was more prevalent than in the years 1913, 1914, or 1916. Certain individual states, such as Vermont, Virginia, and Colorado, reported the disease as more severe than in 1917 but the majority of them, particularly Maine, Massachusetts, Connecticut, New York, Pennsylvania, and Louisiana, reported it as less destructive. The disease was apparently worst in northern New England, Pennsylvania, Delaware, Virginia, West Virginia, Tennessee, some of the Gulf Coast regions and certain areas in the North Central States. It was of minor importance in the South Atlantic States and rare or absent in states west of the Missouri River. Colorado seems to have experienced more trouble with the disease than is usually the case.

The highest estimated percentage of loss was 18% from Maine. In that state from 20 to 30% of the crop was reported injured. In Vermont and New Hampshire losses of about 10% were sustained. In Mississippi, J. M. Deal estimated the loss for the state at 5% and reported that the county agent of Harrison County estimated a damage of 10% for that county. The disease is also reported as causing a great deal of trouble in green bean fields in the vicinity of Crystal Springs, Mississippi, the largest trucking center in the state. The green bean crop in Alabama, Louisiana, and Tennessee is thought to have been reduced about 3%, 3%, and 6% respectively.

Anthrachnose was reported as first being noticed in 1918 as follows:

May 15.....	Florida	June	Maine
May 6	Louisiana	July 1.....	Missouri
May 7	Texas	July 1.....	Colorado
May 15.....	Massachusetts	July 8.....	Alabama

June 6.....	Tennessee	July 12.,.....	Illinois
June 6.....	Mississippi	July 21.....	Pennsylvania
June 10.....	Michigan	July.....	Oklahoma
June 11.....	Minnesota	Aug. 6.....	New Hampshire
June 15.....	New York	Aug. 15.....	Wisconsin
June 28.....	Virginia	Aug. 20.....	Georgia

Late planted beans were most affected in Pennsylvania, due perhaps to weather conditions early in the development of the plants. The Hodson Wax in Virginia, White Kidney in Maine, Wells Red Kidney in New York, and Kentucky Wonder and born field bean in Georgia were said to show resistance, while the Yellow Eye in Maine was reported as especially susceptible.

The use of home grown seed in Louisiana is reported as giving excellent results. Selection of seed from disease-free plants or pods, and also the use of resistant strains is reported as giving satisfactory results where practiced in New York.

Mosaic (Cause undetermined).

Mosaic was reported from New York, Virginia, Arkansas, Indiana, Illinois, Michigan, Kansas, Washington, Oregon, California, and for the first time from Massachusetts, Connecticut, New Jersey, Pennsylvania, Tennessee, South Carolina, Georgia, Florida, Louisiana, Texas, Wisconsin, and Idaho. It was reported as not found in Maine, New Hampshire, Mississippi, Missouri, Wyoming, Colorado, New Mexico, and Nevada.

In importance the disease is rapidly becoming a close rival of bacterial blight, and evidence indicates that it was more serious than anthracnose in 1918. The estimates of losses range from a trace to 5% in Tennessee, 8% in New Jersey, 15% in New York and Pennsylvania, and 20% in Oregon.

In the commercial dry bean section of western New York, where a rather careful survey was made by Reddick and Burkholder, it is estimated that from 15 to 20% of the plants were affected. According to these observers, almost 50% of the pea and medium beans were injured in this section where these varieties include about half of the crop. The estimates were based on observations on 863 acres in 103 fields, in nine counties.

Rust caused by Uromyces appendiculatus (Pers.) Lev.

Rust occurred as usual chiefly in the eastern portion of the United States. It was reported from California and all states east of Colorado and Wyoming except Minnesota, Iowa, Mississippi, North Carolina, New Hampshire, and Vermont.

It was apparently most severe in Virginia, West Virginia, Tennessee, Louisiana, and was bad in southern Ohio. In these states it seems to be one of the important bean diseases. The losses were heavy on certain varieties but in general the loss for any one state was slight. In Georgia 10% loss is reported in individual fields but only about 1% for the state as a whole. In Louisiana the loss was heavy on susceptible varieties but slight for the entire crop. In Tennessee it is estimated that the disease injured half of the crop and is increasing in amount from year to year. In Virginia rust was reported in some fields, causing 100% injury. The loss for the state is put at 10%. In Colorado the yield was reduced not over 2% on account of rust.

There seems to be a relation between the amount of injury and the stage of the host. Thus in the northern states the rust usually appears too late in the season to do much damage. In the Virginia, Tennessee area it seems to attack the pole and shell beans early enough to seriously reduce the yield while the snap beans are often mature before much injury takes place. In the states further south it seems to do the most damage to the later maturing beans.

Dates when rust has been reported to have been observed:

1917

June..... Louisiana	Aug. 1..... Massachusetts
July 6..... West Virginia	Aug. 1..... Virginia
July 15..... Michigan	Aug. 4..... New Hampshire
July (late)... Alabama	Aug. 8..... New York
July (late)... New Mexico	Sept. 1..... Maine
Aug..... Tennessee	Sept. 1..... Indiana
Aug..... North Carolina	Sept. 1..... Colorado
Aug..... Texas	Sept. 12..... Pennsylvania

1918

May..... Louisiana	Aug..... Wisconsin
July 1..... West Virginia	Aug. 11..... Connecticut
July 1..... Tennessee	Aug. (late)..... Maine
July 1..... Georgia	Sept..... Oklahoma
July 1..... New Mexico	Sept. 1..... New York
July 10..... Virginia	Sept. 16..... Pennsylvania

Pole and navy beans were mentioned most frequently as being susceptible. The following list shows varietal susceptibility as it was reported in 1918.

Affected

Pole beans: (Conn., N.Y., La.)
Kentucky Wonder (Me., Mass., Va., Calif.)

Crease Back (Me.)
Case Knife (Conn.).

Bush beans:

Navy Pea (Va., Ala., La.)
White Kidney (Tex.)
Lady Washington (Me.)
Stringless Green Pod (Me.)
Colorado Pinto (Me.)
Idaho Small White (Me.)
California Pink (Texas, Calif. Me.)

Not Affected.

Pole beans:

California Cranberry (Me.)
Horticultural Pole (Me.)

Bush beans:

Long-podded Forcing (Me.)
Long-podded Green (Me.)
Horticultural Bush (Me.)
California Red Kidney (Me.)
California Black-eye (Me.)
Lady Washington (Calif.)

Dry root rot caused by Fusarium martii var. phaseoli, Burkholder.

In New York, where the disease has been serious for some years, it continued destructive in 1918. It was most prevalent as usual in the western part of the state where large quantities of dry beans are raised annually. Apparently the continued cropping of the land to beans in this section has

resulted disastrously. The disease also occurred in northern New York to some extent. The accompanying map shows the approximate known range of dry root rot in New York.

Observations by D. Reddick and W. H. Burkholder in 103 commercial bean fields in 9 counties in the western part of the state showed the disease to be present in amounts ranging from a trace to 15% with an average of 5-10%. In this section at least 50% of the fields showed diseased plants. In Schuyler and Livingston Counties C. Chupp found the disease to be affecting nearly 25% of the plants on the average. It was estimated that for the state as a whole the loss would range from 5 to 10%, or from 72,000 to 145,000 bushels.

Dry root rot has not been reported definitely to the Survey from other states in 1918 but

other states, such as Colorado, Michigan, Vermont, Virginia, Mississippi, Louisiana, and Florida have reported trouble with stem and root rots of uncertain causes. The extent to which Fusarium martii var. phaseoli is responsible is not known. An effort should be made to learn more about the range and losses caused by this fungus. Specimens should be sent to the Plant Disease Survey, or to W. H. Burkholder, New York State College of Agriculture, Ithaca, New York.



Fig. 5. Approximate known geographical range of bean dry root rot in New York. (After map prepared by C. Chupp.)

Powdery Mildew caused by Erysiphe polygoni De C.

Reported from Texas by J. J. Taubenhaus in several counties but unimportant, and by L. R. Hesler from San Benito. Reported from California in the fresh vegetable district and also in Ventura County, the dry bean district, where Kentucky and California Pink varieties are more susceptible than Limas or Lady Washington. Common in Porto Rico on mature plants but causing little harm.

Downy mildew caused by Phytophthora terrestris Sherb.

Reported by J. A. Stevenson as very destructive in parts of Porto Rico where entire gardens are often ruined. The occurrence of this fungus on beans is interesting as this is the first report to the Plant Disease Survey of its being parasitic on this host. Heretofore it has been reported only on tomato.

Stem rot caused by Rhizoctonia solani Kuhn.

Stem rot was reported from almost all sections of the country. General in each state reporting and doing a moderate amount of damage. The disease is perhaps more prevalent than supposed and its importance frequently underestimated.

Reported from Massachusetts (General, slight), New York (General in bean section, no loss except on seedlings), Pennsylvania (Scattered, moderately severe, considerable injury in gardens), Maryland (Local), Georgia (Local), Florida (General, moderately severe). Beans grown on soil that was said to be virgin showed typical rhizoctonia blackening of stems just below the ground line), Mississippi (Local, slight, less than 1% loss), Louisiana (Slight), Texas (General, very slight), Ohio (Local), Minnesota, Colorado (Local, moderate), Washington (General, moderately severe). In Florida it was especially prevalent where the ground was used for potatoes the previous year. In Colorado it was prevalent throughout the Arkansas Valley where the losses in some fields reached 20-30%. In practically all cases the disease appeared on land which was in sugar beets in 1917. In Texas a loss of about 2% is estimated.

Sclerotial blight caused by Sclerotium rolfsii, Saoc.

Found throughout the southern states doing a moderate degree of damage though usually not of great commercial importance. Reported from Georgia (General, doing 10% injury in individual fields. An estimated loss in state of about 5%. Earliest report of disease, May 10), Porto Rico (Several reports), Alabama (Found repeatedly in southeastern section), Mississippi (Locally, appears to be of importance), Texas (General over Cameron County on May 7th and 8th, plants were noted in all stages of development of the trouble).

Watery Soft Rot caused by Sclerotinia libertiana, Fckl.

In the inspection of products at the various markets during the season of 1918 Sclerotinia rot was found to be present in shipments of green beans from Alabama, Florida, Georgia, Louisiana, Maryland, Mississippi, North Carolina and Texas, the largest shipments coming from Louisiana.

Of the twenty-six cars of beans coming from Louisiana, watery soft rot was present in thirteen cars. In most of these cars about 10% of the beans were affected. Beans in a few cars averaged as high as 50% infection.

Twelve cars of Mississippi beans were inspected and Sclerotinia infection was noted in the contents of five cars, the decay being variable, one car with half of contents affected, the other cars showing less decay.

In the shipments coming from the other states mentioned Sclerotinia rot was present in but few cars, the beans from Georgia, North Carolina and Texas being more heavily affected.

It was noted that the decayed beans in all cases were nested in a heavy growth of white mold and the decay was heaviest at top of load.

Rot caused by Botrytis sp.

Gray mold was present in shipments of green beans from Georgia, Louisiana, Mississippi and Texas. In one car of beans from Texas 75% of the beans were covered with gray mold; Georgia beans ranged as high as 50%. Beans coming from Louisiana and Mississippi were not so heavily decayed, averaging about 10%.

• Root and stem rots caused by Fusarium spp.

Reported for the first time from Virginia, South Carolina, Wisconsin, and Colorado. This disease is scattered throughout the United States, usually general and at times of a very severe nature. Reported from Massachusetts (General, very slight), New York (General, especially in western section. (See dry root rot, page 73-74) Loss ranges from 5 to 10%), Virginia (First report, one record in Campbell County, where entire crop was injured), South Carolina (First report, common over entire state), Louisiana (Very common, large percent of crop injured, estimated loss about 5%, earliest appearance April 6), Wisconsin (First report, very limited, only found at Madison. Crop injury very slight, no special search was made.), Colorado (First report, scattered. Injury 8-12%, estimated loss 5% for state. Earliest report July 22).

Rot caused by Rhizopus sp.

In two cars of beans, one each from Mississippi and Louisiana, an occasional moldy nest of decayed beans was found. Reported also from Oregon (green beans in market).

Sunscald (non-parasitic)

Sunscald was reported serious and general in both Pennsylvania and Michigan. In the Lower Peninsula of the latter state the injury was said to be widespread on the leaves. In this region its presence was due to the fact that most of the section had suffered from drought during the growing season. According to E. F. Woodcock, 63% of the fields observed showed the injury present. Thirty-six percent of the affected fields showed it in amounts of over 1%. In one case in Grand Traverse County 50% injury was observed on Robust Pedigree while on the same farm, under similar soil and cultural conditions, another field of ordinary field beans showed only 15% injury due to sunscald.

Other diseases and injuries

Texas root rot caused by Ozonium omnivorum Shear was of minor importance. It was reported from Texas (Restricted locally, 1% estimated loss), Oklahoma (Found in a small garden patch).

Black root rot caused by Thielavia basicola (B. & Br.) Zopf. was present in New York, especially in the lower tier of counties in western part of state. The injury was very slight.

Leaf spot caused by Phyllosticta phaseolina Sacc. was reported from Texas, Michigan (Local and unimportant). Not observed in Ohio, Wisconsin, New Jersey, Minnesota, and Louisiana.

Leaf spot caused by Cercospora sp. was reported from Porto Rico (Occasional), Texas (Caused an estimated loss of 2% of the crop in restricted areas).

Leaf spot caused by Alternaria sp. was reported from Louisiana (Specimens on pole and bush beans collected in the vicinity of New Orleans).

Leaf and pod spot caused by Diaporthe phaseolorum was reported from New Jersey (Rather less abundant than in 1917.)

Leaf and pod blight caused by Phoma sp. was reported from Ohio.

Gray leaf blotch caused by Isariopsis griseola Sacc. was reported from Connecticut (One report from New Haven County). In Porto Rico it was widespread, especially serious as a cause of defoliation and pod spotting of certain varieties.

Frost injury was reported from Washington (Severe in Whitman County, moderately severe in Pierce County).

Chlorosis was prevalent in Texas where it was estimated as causing a loss of 1%. Taubenhauß expressed the opinion that the trouble may be induced by an excess of lime.

Root knot caused by Heterodera radicum (Greef.) Mull. was reported from Arkansas and Alabama.

ONION

Smut caused by Urocystis cepulae Frost

Smut was reported in 1918 from Massachusetts, New York, New Jersey, Pennsylvania, Tennessee, Ohio, Iowa, Colorado and Oregon. In years prior to 1918 it has been reported to the Survey from the following additional states: Maine, Connecticut, Delaware, West Virginia, Kentucky, Indiana, Illinois, South Dakota, Kansas, Alabama, Texas and Arizona.

For the most part the disease was localized in the regions of most intensive onion culture. Thus in Massachusetts it was most prevalent in the Connecticut Valley and Boston districts; in New York it was found in all the important onion growing sections especially in the black land meadows of the Wallkill River in Orange County, and in Wayne County; in New Jersey it was most serious in Warren and Burlington Counties; while in Wisconsin it was found principally in Racine and Kenosha Counties.

The highest loss was reported from New York where it is estimated that 15% reduction in yield of marketable onions took place. In the Wallkill Valley onion section of New York numerous counts were made in 23 fields and nearly half the onions were found to be diseased. The extent of the injury ranged from killing of the plants to smutting of the base of the outer leaves. In 1917 the loss in this county (Orange) was placed at 2 to 10%. The loss for Massachusetts was estimated at 2% altho in local instances as high as 25% infected plants were observed. In New Jersey one field was observed in Burlington County with 50% affected plants, while in Pennsylvania, Wisconsin and Oregon 40, 75 and 90% respectively were observed in local instances. At Racine, Wisconsin, untreated fields showed 5 to 75% (average 35%) smutted plants. In 1917 losses were reported as follows: Ohio, 15 to 20% disease in infested fields; Illinois, 25% crop injury and 10 to 15% loss; Oregon, \$25,000 loss.

The accompanying table has been compiled from data contributed by I. C. Jagger, J. C. Walker, H. W. Dye, E. W. Olive, C. R. Orton, A. V. Osman and others.

Table VIII. Results of experiments and demonstrations in the control of onion smut by the formaldehyde drip method.

State	Reporter	Treatment	Strength of so- lution (gallons): water used with: 1 pint formal- dehyde).	Amt. per acre (gallons)	Results				
					Percent infected plants	Yield (bushels per acre)	Increase		
Mass. 1918	Osmun, A.V.	9.4	-	-	Treated:	Untreated:	Treated:	Untreated:	Increase
		16	50	11.1:	88	487	28	28	459
		21.875	250	15.9:	88	461	28	28	453
		21.875	200	18.3:	88	395	28	28	367
		21.875	100	30.3:	88	308	28	28	280
		18.75	250	5.3:	88	500	28	28	472
		18.75	200	8.3:	88	508	28	28	480
		18.75	150	7.2:	88	487	28	28	459
		18.75	100	17.6:	88	397	28	28	369
		15.62	250	1.0:	88	491	28	28	465
N. Y. 1917*	Jagger, I.C.	15.62	200	4.1:	88	495	28	28	467
		15.62	150	4.4:	88	491	28	28	463
		15.62	100	10.8:	88	454	28	28	426
		12.5	250	3.2:	88	464	28	28	436
		12.5	200	0.8:	88	473	28	28	445
		12.5	150	1.7:	88	440	28	28	412
		12.5	100	7.6:	88	417	28	28	389
		9.375	250	2.6:	88	439	28	28	411
		9.375	200	4.4:	88	455	28	28	427
		9.375	150	0.9:	88	446	28	28	418
		9.375	100	4.1:	88	444	28	28	416
		Check plots(10)	-	(aver)-:	88	(aver) -	28	28	416

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N. Y. 1918	: Olive & Dye	: 16	: 225	: 1-7	: 28-38	: 816	: 514	: 302
	: :	: 10	: 200	: 1	: 28-38	: :	: :	: :
	: Dye, H. W.	: 16	: 200	: 10	: 49	: 826	: 447	: 379
	: :	: 16	: 200	: 2	: 37	: 846	: 495	: 351
	: :	: 16	: 200	: -	: -	: 555	: 261	: 294
	: :	: 16	: 200	: -	: -	: 423	: 165	: 258
Penn. 1917	: Orton, C. R.	: 16	: :	: 10-15	: 90.0	: 553	: 374	: 179
1918	: :	: 4	: :	: 10-15	: 90.0	: 586	: 287	: 299
Wisc. 1913	: Walker, J. C.	: 32	: 118	: 27.5	: 24.0	: 341	: 320	: 21
	: :	: 16	: 118	: 5.6	: 24.0	: 506	: 320	: 186
	: :	: 8	: 118	: 2.6	: 24.0	: 588	: 320	: 268
1914	: :	: 16	: 118	: 13.4	: 51.2	: 344	: 86	: 250
	: :	: 8	: 118	: 10.3	: 51.2	: 283	: 86	: 197
	: :	: 4	: 118	: 11.5	: 51.2	: 216	: 86	: 130
	: :	: 16	: 236	: 10.2	: 51.2	: 396	: 86	: 310
	: :	: 8	: 236	: 6.2	: 51.2	: 409	: 86	: 323
1915	: :	: 4	: 236	: 6.3	: 51.2	: 299	: 86	: 213
	: :	: 16	: 118	: 28.6	: 52.6	: 632	: 400	: 232
	: :	: 8	: 118	: 15.4	: 52.6	: 722	: 400	: 322
	: :	: 16	: 236	: 3.6	: 52.6	: 748	: 400	: 348
	: :	: 8	: 236	: 3.2	: 52.6	: 655	: 400	: 255
1916	: :	: 22	: 100	: 43.1	: 54.9	: 117	: 72	: 45
	: :	: 15	: 100	: 29.0	: 54.9	: 164	: 72	: 92
	: :	: 9	: 100	: 13.7	: 54.9	: 178	: 72	: 106
	: :	: 22	: 150	: 31.4	: 54.9	: 182	: 72	: 110
	: :	: 15	: 150	: 24.2	: 54.9	: 207	: 72	: 155
	: :	: 9	: 150	: 14.6	: 54.9	: 205	: 72	: 133
	: :	: 22	: 200	: 17.7	: 54.9	: 296	: 72	: 224
	: :	: 15	: 200	: 5.8	: 54.9	: 351	: 72	: 279
	: :	: 9	: 200	: 7.1	: 54.9	: 247	: 72	: 175
1918	: Vaughan, R. E.	: :	: :	: :	: :	: :	: :	: :
	: Walker, J. C.	: 16	: 200	: 2.5	: 25-75	: 682	: 186	: 496
Ohio 1918	: Selby, A. D.	: 25	: 200	: :	: Good Results.	: :	: :	: :

*In this experiment each treatment was made in triplicate so that the yield and percentage figures represent the average of three plats.

The results obtained in New York and Wisconsin recorded in the preceding table seem to show that one pint of formaldehyde with sixteen gallons of water applied at the rate of two hundred gallons per acre, is the most satisfactory treatment. According to Jagger, an essential part of the recommendation is that the seed be covered to a depth of not more than one inch but, as he points out, this in the majority of cases is superfluous as onion seed are generally covered to a depth of three-fourths to one inch.

The practice of soil treatment with formaldehyde at time of planting is increasing. All states mention excellent results with it. In Massachusetts many growers have not been applying enough solution in the past. The amount as at present recommended (200 gals. per acre) is said to be giving better results.

Sulphur still seems to be considerably used in some states. E. W. Olive reported that many farmers in Orange County, New York, have treated the seed rows with powdered lime and sulphur mixtures for years without securing smut control. On the contrary there is often marked injury in the form of root burning in some cases. In Erie County, Pennsylvania, where sulphur is used to some extent, the results are much in favor of formaldehyde.

Smut was first brought to the attention of collaborators in 1918 as follows:

May..... Wisconsin	May 22..... Pennsylvania
May..... Oregon	June 6..... New York
May 5..... Massachusetts	

Downy Mildew caused by Peronospora schleideni Ung.

This disease was reported from New York, Louisiana, Ohio, Missouri, Washington and California. In previous years it has been reported also from Maine, Connecticut, Pennsylvania, West Virginia, Kentucky, Arkansas, Wisconsin, Michigan, Minnesota, and Oregon. Reports of its non-appearance were received from New Hampshire, Massachusetts, Tennessee, Georgia, Mississippi, Texas, Oklahoma, Indiana, Kansas, Montana, and New Mexico.

In all the states but Louisiana its occurrence was local. During 1918 the damage was slight in most cases, although there was considerable damage in Louisiana and a moderate amount in Washington, while in California severe cases of downy mildew were found in some of the fresh vegetable districts. During 1915 an epidemic of downy mildew occurred in Michigan. Mildew and neck rot are among the deciding factors of onion growing in that state. In the same year in Oregon, where it is one of the most serious onion troubles, the loss was probably in the thousands of dollars.

Wet, warm weather is said to be most favorable for rapid growth of the fungus. Fields in low, wet situations are most affected in New York.

Bordeaux is not always successful. Sometimes this may be due to too few applications of the spray, for in 1916 Bordeaux applied upon onions in Louisiana three times a week throughout the rainy season gave satisfactory results.

Neck rot caused by Botrytis sp.

Neck rot, a storage trouble, was reported mostly from the northern portion of the United States during 1918, though some was found in the South. It was reported from Massachusetts, Connecticut, New York, Pennsylvania, Kentucky, Florida, Texas, Ohio, Illinois, Michigan, Wisconsin, Missouri, Oregon, and California. It has been reported prior to 1918 also from West Virginia, Indiana, and California.

The disease was quite common in Massachusetts, Pennsylvania, and Michigan, and somewhat local in Oregon. There was less than the usual amount in Connecticut.

Considerable loss occurred while the crop was in transit, the infection ranging from 2 to 40% while one car from California was a total loss on account of this disease and soft rot. In Connecticut the crop injury amounted to about 4%. In Pennsylvania the loss was about 1% from neck rot. In Michigan the loss was slight, although in previous years it has been considerable (1915, 50%).

This disease in Pennsylvania seems to be worst on onions grown in fields or ground which is low and not well drained.

While the Globe was most susceptible in Connecticut and Wisconsin (especially bad in sets), South Port was most susceptible in Connecticut. In Wisconsin Bronze was most resistant.

Kiln drying as a treatment was successful where it was tried as an experiment in Wisconsin.

Leaf blight caused by Macrosporium sp.

Leaf blight was reported from Massachusetts, Louisiana, Ohio, and Washington. It has been reported in addition to the above named states prior to 1918 from Rhode Island, Connecticut, New York, Ohio, Indiana, Michigan, and Utah. It has been reported as general in Louisiana for about nine years. Last year it was abundant but less than in previous years. It was general throughout the Connecticut Valley in Massachusetts, and local in Washington.

Considerable damage is caused annually in Louisiana by Macrosporium blight, in 1918 the estimated loss to the seed crop being 25%.

According to D. C. Neal, onions in Louisiana sprayed in the spring were comparatively free from disease and a good quality of seed was produced.

Smudge caused by Vermicularia circinans Berk.

Smudge was reported from Massachusetts, New Jersey, New York, Pennsylvania, Delaware, Virginia, Louisiana, Texas, Ohio, Indiana, Illinois, and Wisconsin. Reports stating that it had not been collected in the field in 1918 were received from Maine, New Hampshire, West Virginia, Kentucky, Tennessee, South Carolina, Georgia, Florida, Oklahoma, Arkansas, Missouri, Kansas, Montana, Wyoming, Colorado, Nevada, Washington, and California.

It was mostly local in its occurrence except in Wisconsin, where it was said to be general. There were no reports of serious losses.

The white varieties were reported badly affected in Massachusetts, Delaware, and Wisconsin, while red and yellow varieties were mentioned as resistant in Wisconsin. A 1906 report from New York states that in that year Vermicularia was abundant on a red variety.

Black mold caused by Aspergillus niger

This storage and transit trouble caused a moderate amount of damage in 1918 although at times the infection was reported as high as 90%. It was found on shipments from New York, Pennsylvania, Texas, Ohio, Indiana, Illinois, Missouri and California.

In the central portion of California a heavy rainfall occurred after the onions were dug but remaining in the field, which resulted in a heavy infection. According to growers and shippers in the Coachella Valley, the crop was affected to the extent of 90%. Many bulbs held over for planting were so badly decayed that they were dry and powdery like puff balls.

Pink root caused by Fusarium malli, Taub.

This disease was reported from Louisiana and Texas. It was general on onions in some fields of Lafourche Parish. In Texas it was very general in the Laredo district, but was slight in Mission and McAllen district.

The damage caused by this organism was slight in Louisiana but in Texas large losses were experienced. In the Laredo district the yield was reduced about 50% on 4,000 acres, while in the Mission and McAllen district the loss was unimportant.

Affected plants produce very small bulbs. The disease may and does affect seedlings in the seed bed, or plants may be first attacked in the field after setting. It was apparently worse on land in which onions had been grown for several years.

Varieties show certain differences in susceptibility, the most susceptible being the Crystal Wax. White and yellow varieties are more susceptible than red.

Since the causal factor is found in the soil, rotation is suggested as a means of control. In the Mission and McAllen district of Texas, where rotation is considerably practiced, pink root is not a factor in onion growing. One field in this district which had grown onions for six years showed considerable amount of the disease as did the old onion lands in the Laredo district, where four to five year rotation periods were not long enough to starve out the organism after it had become firmly established.

Steam sterilization or formaldehyde disinfection of seed beds is successful. Lime applications are not successful. Fertilizers rich in nitrogenous and organic matter are especially valuable for use in infested soils.

Fusarium rot caused by Fusarium sp.

Occurred in New England and the Pacific northwest during 1918. It was reported from Massachusetts, Connecticut, Idaho, and Washington. The same, or similar troubles have been reported several times from Ohio and once from Louisiana, but so far have not done any great damage. Judging by the work of Fusaria on other hosts, one is led to look upon this disease with suspicion and watchfulness.

Soft rot caused by Bacillus carotovorus Jones.

Bacterial soft rot was the cause of heavy losses during 1918. A large part of the injury occurred in transit. In inspection at the various markets decay was found in onions originating in the following states: California, Florida, Colorado, Illinois, Iowa, Kentucky, Louisiana, Massachusetts, Michigan, Minnesota, Missouri, New Jersey, New York, Ohio, Pennsylvania, Texas, Virginia, and Washington, also three cars of Spanish onions inspected at New York.

The largest number of shipments originated in Texas, the contents of 73 cars showing decay. Of this number an average of 40-45% bacterial soft rot was found in 33 cars of onions; the onions in the other 40 cars showed 3 to 15% decay with a probable average of about 8%. Many cars from Texas contained onions of Bermuda varieties.

California onions ranged from 5 to 15% in a majority of cars, and 30-45% decayed onions were found in 4 cars, a large part of which was complete decay.

An average of 9% decay was noted in 23 cars of onions presumed to have originated in Illinois, the onions in 3 cars being more heavily decayed. Iowa onions also were badly decayed, much complete decay being noted.

The onions from the other states named were somewhat less decayed.

Imported Spanish onions were badly decayed, 50% of the onions in 2 cars being worthless. Only slight decay was found in the other car of onions, about 25% of contents affected.

Other diseases.

Root knot caused by Heterodera radicicola (Greef.) Mull. was reported from Texas. Great difficulty was experienced in growing onions on a farm at Laredo because of nematodes.

Tip burn was reported from Iowa as very common and destructive.

Mosaic of onion has so far been very local as reports concerning its occurrence have come only from West Virginia, where it was observed on the variety Multiplier in 1917. In 1918 in West Virginia it was doing a moderate amount of damage in Fayette County, and a slight amount in Barbour County.

Blossom blast was reported from Connecticut, where it occurred in less than usual amounts. The crop injury was small.

Rot caused by Sclerotinia sp. was reported from Florida and Ohio. It was local in Ohio where it appeared in 1915 and 1917. Reported from Washington in 1915. This decay was found to be present in 3 cars of onions, 2 from Texas and 1 from California. Decay in Texas onions ranged from 3 to 16%, California onions averaging about 6%, the decayed onions having the white mold characteristic of S. libertiana.

THE PLANT DISEASE BULLETIN

Issued By

The Plant Disease Survey

SUPPLEMENT 3

Summary of Plant Diseases in the United States
in 1918 - Diseases of Field and Vegetable Crops.
(Continued)

June 10, 1919

BUREAU OF PLANT INDUSTRY

UNITED STATES DEPARTMENT OF AGRICULTURE



SUMMARY OF PLANT DISEASES IN THE UNITED STATES IN 1918

III. DISEASES OF FIELD AND VEGETABLE CROPS (Continued)

Prepared by
R. J. Haskell and G. H. Martin, Jr.

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DISEASES OF SWEET POTATO

Stem rot caused by Fusarium batatatis Woll. and F. hyperoxysporum Woll.

Stem rot in 1918 was about as prevalent as in 1917 and probably more so than in 1916. It was found in New Jersey, Delaware, Maryland, Virginia, North Carolina, South Carolina, Florida, Alabama, Louisiana, Texas, Arkansas, Oklahoma and Kansas.

It was more abundant in the northern sweet potato states than in those of the South. It was said to be general in New Jersey, Delaware, Virginia (on the east shore and near Williamsburg), North Carolina, Louisiana, Oklahoma (southeastern part), Arkansas and Kansas. It was somewhat scattered in Maryland and Alabama, local in Tennessee, South Carolina, Florida and Texas.

This disease caused severe losses, taking as high as 90 to 100% of the crop in local cases. The states where the greatest losses occurred apparently were New Jersey, Delaware and Maryland, in which from 18 to 20% of the crop was destroyed. The remaining states sustained losses ranging from a trace to 8%.

Reports from Maryland, North Carolina, Louisiana, and Oklahoma show that it is being introduced into these states on potatoes and slips brought in from infested areas. It was first reported in June in Louisiana, September in Kansas, and September 15 in Tennessee. In Florida the Nancy Hall was reported as extremely susceptible, while Triumph and Porto Rico were more or less resistant.

Foot rot caused by Plenodomus destruens Harter.

Foot rot was present during 1918 in New Jersey, Maryland, Virginia, Florida, Missouri, Iowa and California. It was reported not found in Delaware, South Carolina, Louisiana, Texas, Oklahoma and Arkansas.

It was said to be of slight prevalence in Maryland and abundant in Virginia. In Florida only a trace was found.

The losses were slight in most of the states where it occurred. In the northern end of Accomac County, Virginia, there was a crop injury of about 15% with a 2% loss for the state. In Missouri there was about 2% crop injury and 1/2% loss.

Black rot caused by Sphaeronema fimbriatum (E. & H.) Sacc.

Black rot was reported found in New Jersey, Delaware, Maryland, Virginia, Kentucky, Tennessee, North Carolina, South Carolina, Georgia, Mississippi, Louisiana, Texas, Oklahoma and Arkansas.

It was reported general in New Jersey, Delaware, Kentucky, Tennessee, South Carolina, Mississippi, Louisiana, Texas, Oklahoma and Iowa. It was scattered in Georgia, Arkansas and Kansas. It was said to have been less prevalent in 1918 than 1917 in New Jersey, Delaware and Oklahoma.

It was apparently most severe in Maryland, Tennessee, South Carolina, Georgia and Texas, where the losses ranged from 7 to 10%. It was less severe in New Jersey, Delaware and North Carolina and slight in the remainder of the states.

In Georgia black rot is showing where the seed potatoes are neither selected nor treated. In Oklahoma it was worst on imported stock. Patches set from slips instead of cuttings were especially affected in Louisiana. Drought in Texas aided materially in checking the trouble. No varietal resistance was reported.

It appeared as follows:

July..... Louisiana

July 18..... Virginia

September..... Kansas

Sept. 15 Tennessee

Soil rot (formerly called pox) caused by Cystospora batata Elliott

Soil rot was apparently more abundant in 1918 than in the preceding years. The disease appears not to have spread rapidly. It was reported from New Jersey, Delaware, Texas, Arkansas (first report), and Kansas (first report). It was reported not to have been found in Kentucky, Louisiana and Oklahoma.

It was very plentiful in Delaware in the district from below Felton extending to Harrington and eastward to include the area to Frederica, Houston,

Mulford and Lincoln. In Texas it was common, being one of the three most important sweet potato diseases there. In Arkansas it was somewhat scattered. In Kansas it was said to be very prevalent.

The loss was somewhat severe in Delaware in the Houston district where on one farm the damage ran as high as 85%. The average loss for the state was 5% or more. In Texas it was severe with a 4% loss. In Arkansas it was moderately severe. In Kansas it produced a crop injury of about 5%.

Drought in Texas prevented it from being as severe as if there had been abundant moisture. Where the crop had been grown in a field in Delaware continuously for eight years the loss was high.

Control methods recommended in Delaware were rotation, seed selection, seed treatment (1 oz. HgCl₂ in 8 gal. H₂O for 15 min.), and change of soil.

Scurf caused by Monilochaetes infusans E. & E.

In 1918 reports were received from an unusually large number of states. It was found in New Jersey, Delaware, Maryland, Virginia, Kentucky (first report), Tennessee (first report), South Carolina, Georgia, Alabama, Arkansas, and Missouri (first report).

In most of the states the disease was general in distribution but in Delaware and Georgia it appeared to be limited. Although the actual loss was slight the crop injury in many cases was high. In New Jersey from 1 to 50 or 60% of the crop was injured. In Virginia the infection ranged from 50 to 75%, which averaged for the state 30%. In Kentucky 1-2% loss is recorded. In Tennessee infection ran as high as 50%. In South Carolina it was about 15%.

It was noticed September 1, in Tennessee and September 15 in Missouri. Very little varietal resistance was noted although in Missouri Nancy Hall was not affected seriously.

Soft rot caused by Rhizopus nigricans Ehr.

Soft rot was reported found on sweet potato in the field and in storage in New Jersey, Virginia, South Carolina, Alabama and Arkansas.

Injury in the field in Virginia was about 3% and in South Carolina around 2%. In Arkansas the rotting in the field was severe, in some local sections practically all potatoes were destroyed.

Storage damage in Virginia amounted to about 75% of the crop in some places. In South Carolina it was very high. The approximate loss of the crop from soft rot in New Jersey was about 1%, and in Tennessee about 50,000 bushels were estimated lost. Below is given a summary of the losses from the disease in transit as found by inspection at the various markets.

Table IX. Percentages of Rhizopus decay as shown by market inspection during the season of 1918.

Origin of shipment	No. of cars with rot	Percentage of decay	Remarks as to seriousness of decay
Alabama	3	3 cars 5%	Decay irregular, some hampers no decay, others 25%.

Arkansas	2	1 car 1%	Over half of hampers with 2 to 6 decayed potatoes.
		1 " 23%	
California	1	20-30%	In all parts of load.
Delaware	32	2 cars 80-98%	Almost total loss.
		1 " 55%	Specimens at least half decayed.
		11 " 30%	Decay bad in all cars, some totally decayed stock.
		11 " 15%	Decay mostly slight, some bad decay in every car.
		7 " 5%	Slight decay.
Illinois	1	16-18%	Complete decay of affected stock.
Louisiana	3	2 cars 8-20%	Decay bad in both cars.
		1 car 0-50%	Some total decay, other potatoes half decayed.
Maryland	7	1 " 43%	Most specimens completely decayed.
		2 " 23-25%	Affecting entire potato.
		3 " 10%	Most affected stock worthless.
		1 " 5%	Slight in most cases.
Mississippi	1	5%	-----
New Jersey	6	1 car 49%	Affected potatoes worthless.
		3 cars 20%	Bad decay in all cars
		2 " 25-30%	-----
Oklahoma	1	2%	Slight decay
South Carolina	1	33%	Affected potatoes worthless.
Tennessee	3	2 cars 21-25%	Advanced stage.
		1 " 10%	Part slight, part bad.
Texas	3	2 " 2-5%	Slight.
		1 " 17%	Affecting half to entire area.
Virginia	4	10%	Decay irregular, some bad decay in each car.

White rust caused by Albugo ipomoeae panduranae Farl.

White rust was reported from New Jersey, Delaware, Maryland, Virginia, South Carolina, Georgia, Alabama, Porto Rico, Louisiana and Texas. It was not important commercially except in South Carolina where it was common and was said to have caused considerable loss.

Septoria leaf spot caused by Septoria bataticola Taub.

Septoria leaf spot was reported from New Jersey, South Carolina (first report), Alabama, Georgia, Louisiana (first report) and Texas (first report). Reported prior to 1918 from Arkansas, Iowa and Kansas.

No damage was reported.

Leaf spot caused by Phyllosticta batatas E. & M.

Leaf spot was general throughout the South. It was found in Virginia, South Carolina, Alabama, Mississippi, Louisiana, Texas, and Ohio (first report). There was some injury but little loss. It has never been serious enough to cause great damage.

Dry rot caused by Diaporthe batatatis (E.&H.) H. & F.

Dry rot was reported as common in New Jersey and present about Ocean Springs and Biloxi, Mississippi. In the latter section the injury ranged from 2 to 5% with an estimated loss in yield of less than 1%. The Porto Rico variety was affected in every case observed in Mississippi.

Root rot caused by Ozonium omnivorum Shear.

Root rot was reported from Texas where it was general and severe. It was one of the three most important diseases of the sweet potato in that state during 1918. The loss was apparently quite heavy, amounting to about 20% of the crop.

Other Diseases.

Blight caused by Sclerotium rolfsii Sacc. - Reported from Texas and Florida.

Root knot caused by Heterodera radiculicola (Greef.) Mull. - Was reported present in Mississippi and Arkansas. In the southern half of Arkansas it was very severe, the crop injury amounting to about 10%.

Rot caused by Trichoderma koningi Oud. - Reported in 1918 from New Jersey where it has been common since 1915. It was reported present in Delaware from 1911 to 1916. This rot usually follows ring rot or soft rot causing further destruction of the already affected potatoes.

Java black rot caused by Diplodia tubericola (E. & E.) Taub. - Reported by J. A. Stevenson from Porto Rico in 1918. There happens to be no reports of its occurrence in the United States in 1918 although it was reported previously to the Survey.

Charcoal rot caused by Sclerotium bataticola Taub. - Reported in 1918 from Porto Rico. There are no reports in the Survey files of its occurrence in the United States during 1917 and 1918. In 1916, however, it was reported from New Jersey, Florida and Texas.

Rhizoctonia rot caused by Rhizoctonia sp. - Reported from Ellis County, Texas.

Dry rot caused by Schizophyllum alneum (L) Schrot. - Reported from Porto Rico.

Storage rot caused by a species of Fusarium - Quite common in Alabama on potatoes in storage during 1917 and 1918.

Stem and root rot caused by Nectria ipomoeae Hals. - Reported from Ohio.

An internal decay of undetermined cause was found in Lewis County, Washington, affecting sweet potatoes.

A leaf blight caused by Cercospora sp. was reported from Oklahoma. It was not causing any damage.

A purplish leaf spot of unknown cause was reported on slips at Vero, Saint Lucie County, Florida.

Chlorosis (non-parasitic) - Reported from Glascock County, Texas. J. J. Taubenhaus states that the disease resulted from the land being too rich in lime.

Growth cracking due to a rain which followed several weeks of drought was quite serious in Arkansas. In many fields the crop was rendered unmarketable except for local trade. Growth cracks on the tubers of Mississippi potatoes were seen in several cases. In one locality the cracking was probably due to excessive fertilizer in the form of stable manure. The tubers were not hurt for home consumption.

Drought injury occurred in Texas and Arkansas. In Texas it was one of the greatest drawbacks to the sweet potato crop during 1918. The total crop in Belle County was practically a total failure. The drought condition in Tarrant County also considerably reduced the yield.

DISEASES OF CRUCIFERS

CABBAGE

Club root caused by Plasmodiophora brassicae Wor

Club root in 1918 was scattered throughout the northeastern half of the United States. It was somewhat general in prevalence in the states where it appeared and was apparently worst in the extreme northeast. It was found in Maine, New Hampshire, Vermont, Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, West Virginia, South Carolina, Georgia, Ohio, Indiana, Illinois, Wisconsin and Washington. It was reported not to have been found in Kentucky, Mississippi, Louisiana, Oklahoma, Missouri, Kansas, Montana, Wyoming, Colorado, New Mexico and Nevada. In former years it has been reported from the Pacific Coast.

Club root was apparently of slight importance except in Pennsylvania where it produced a moderate amount of injury. In Vermont it caused a crop injury ranging from 10 to 15%. The loss was estimated at between 5 and 10%. In New York 2% of the crop was said to be injured. The loss was estimated at about 5,487 tons.

Yellows caused by Fusarium conglutinans Woll.

Yellows occur most commonly in the South and in a belt which includes many large commercial centers of products extending from Delaware, New Jersey and Pennsylvania through Ohio, Illinois and up through Iowa, the southern half of Michigan, and Wisconsin. The Plant Disease Survey holds no record of the occurrence of this disease in the New England States. Although probably occurring before 1918, it was not reported until then from Texas, Oklahoma, and Colorado. This is the first time it has been reported west of a line extending down the western boundary of Minnesota and intervening states to Louisiana, being new to Louisiana in 1916. It was reported from New York, New Jersey, Pennsylvania, Delaware, Virginia, West Virginia, Tennessee, South Carolina, Georgia, Alabama, Mississippi, Louisiana Texas, Oklahoma, Ohio, Arkansas, Indiana, Illinois, Wisconsin, Missouri, Kansas, Wyoming and Colorado. It was reported not to have been noticed in Maine, New Hampshire, Massachusetts, Connecticut, Kentucky, Montana, New Mexico, Washington, Nevada and California.

The disease seems to be on the increase in Pennsylvania, Tennessee, Alabama, and Louisiana. In Wisconsin there was less than usual. In Mississippi there was the usual amount. In New York the loss was very small. In Pennsylvania it was most serious in Cumberland and Perry Counties where the disease normally attacked plants when they were only a few weeks old. A 5% crop injury and a 2% loss are recorded. In Tennessee the crop injury ran as high as 75% with about a 5% loss. In Georgia the loss to summer cabbage was estimated as at least 25%. In Mississippi in individual cases the loss ranged from 10 to 75% with a probable average of 3 to 5%. The loss was slight in Louisiana, Texas, Wisconsin, Missouri and Nebraska. In Colorado the loss was about 10%.

Dates of first appearance of yellows 1918, according to collaborators:

April 4	Mississippi	June 1	Missouri
May 15	Tennessee	June 10	Pennsylvania
May 21	Georgia	June 10	Virginia
June	Louisiana	June 26	New York

Late cabbages in the South are affected much more than the winter-grown ones.

The wilt-resistant strain developed in Wisconsin continued to give good results both in that and in other states.

Black-leg caused by Phoma lingam (Tode.) Desmaz.

Black-leg has previously been found mostly in the North and East but during 1918 the disease was said to be well established in the South. There were no reports of it from states west of the Mississippi except for Arkansas and Louisiana, although it has been reported from the Pacific Coast in previous years. It was reported from Connecticut, New York, New Jersey, Delaware, Virginia, Tennessee, South Carolina, Alabama, Mississippi, Louisiana, Arkansas, Ohio, Indiana, Wisconsin, Minnesota, Missouri, and Kansas. It was said not to be found in Maine, New Hampshire, Massachusetts, Kentucky, Georgia, Florida, Oklahoma, North Dakota, Montana, Wyoming, and Colorado. It was found prior to 1918 also in Pennsylvania, West Virginia, Texas and Washington.

It was prevalent in New York, South Carolina, Alabama, Arkansas, Wisconsin and Kansas, while in the rest of the states it was local in occurrence and the losses were slight.

Savoy cabbage was found to be almost immune in New York.

Seed treatment with H_2O_2 was used by a few growers in New York. In Wisconsin there was strong evidence that seed disinfection did not eliminate black-leg entirely, especially where the fungus had penetrated the seed coat.

Black rot caused by Bacterium campestre (Pam.) E. F. Sm.

Black rot was found during 1918 in Massachusetts, New York, New Jersey, Pennsylvania, Delaware, Virginia, West Virginia, Tennessee, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Texas, Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, Kansas, Wyoming, and Colorado. It was reported not to have been found in Maine, New Hampshire, Kentucky, Oklahoma, Montana, Nevada and California. Prior to 1918 it was reported from the following additional states: Vermont, Connecticut, Arkansas, North Dakota, Nebraska, New Mexico, Arizona, Utah and Washington.

The disease was general in the states throughout the eastern half of the United States and was locally severe in New Jersey, Virginia, Tennessee, South Carolina, Georgia, Florida, Alabama and Minnesota.

In Pennsylvania the disease had not been seen before as serious as it was in 1918. One field lost 70% of the crop. In Kansas the crop injury ranged from 5% in Riley County to 25% in Lyon County.

Danish Baldhead in Pennsylvania was quite susceptible while Monmouth Red Rock was less so.

Poorly treated seed were considered responsible for the introduction of the disease into Minnesota and grasshoppers were apparently instrumental in the spread of the organism.

Root rot caused by Corticium vagum var. solani Burt.

Root rot was reported in 1918 from Pennsylvania, Ohio and Washington. It has had a wide range, having at one time or another been reported also from Florida, Alabama and Utah.

Reports indicate that at times it causes considerable damage in local areas.

Root knot caused by Heterodera radicicola (Greef.) Mull.

Root knot was found mostly in the southern states. It was present in Tennessee, South Carolina, Georgia, Texas, Arkansas, Ohio, Colorado and California. It was reported not to have been found in Maine, New Hampshire, Massachusetts, Connecticut, New York, West Virginia, Kentucky, Mississippi, Oklahoma, Indiana, Wisconsin, Minnesota, Missouri, Kansas, Montana, Wyoming, New Mexico, Nevada and Washington. Prior to 1918 it was reported found also in Pennsylvania, Virginia, Florida and Louisiana.

The disease was serious in South Carolina and very slight in Texas. It was worst on sandy soils.

Downy mildew caused by Peronospora parasitica (Pers.) De By.

Downy mildew was reported to the Survey from New York, West Virginia, South Carolina, Georgia, Florida, Louisiana, Texas, Ohio, Colorado and California. It was reported not found in Maine, New Hampshire, Massachusetts, Virginia, Kentucky, Mississippi, Oklahoma, Indiana, Minnesota, Missouri, Kansas, Montana, Wyoming, New Mexico and Nevada. It was found prior to 1918 in the following additional states: Connecticut, New Jersey, Pennsylvania, Tennessee, Arkansas, Wisconsin and Washington.

Slimy soft rot caused by Bacillus carotovorus Jones

Slimy soft rot was reported in the field from Pennsylvania, Virginia, Wisconsin and Minnesota and in shipments from Massachusetts, New York, Pennsylvania, Maryland, Kentucky, Tennessee, South Carolina, Florida, Alabama, Mississippi, Louisiana, Texas, Illinois, Wisconsin, Missouri and California.

The injury in the field was slight in Pennsylvania, Wisconsin and Minnesota, but was said to be severe in Virginia. Great losses were reported as occurring in shipments.

The inspectors of the United States Bureau of Markets at the various cities examined cabbage from the following states: Alabama (13 cars), California (4 cars), Colorado (5 cars), Florida (79 cars), Illinois (38 cars), Indiana (2 cars), Iowa (1 car), Kentucky (1 car), Louisiana (11 cars), Maryland (3 cars), Massachusetts (1 car), Michigan (4 cars), Minnesota (23 cars), Mississippi (9 cars), Missouri (3 cars), Nebraska (1 car), New York (106 cars), North Dakota (1 car), Ohio (6 cars), Pennsylvania (2 cars), South Carolina (2 cars), Tennessee (3 cars), Texas (7 cars), Virginia (10 cars) and Wisconsin (22 cars).

The largest number of cars with slimy soft rot originated in New York, 76 cars containing diseased cabbage. Of these cars 15 showed every head with some decay, 28 showed more than 50% affected heads, 8 averaged 25% infection and 25 cars ranged from 3 to 15% decay. There were some totally decayed heads in almost every car but in most cases the decay affected only from 3 to 5 outer leaves.

The second largest number of cars showing decay (37) came from Florida. In 8 of these cars 100% of heads showed some decay, 7 cars ranged from 40 to 90% affected heads, and 22 cars showed 5 to 25% decayed cabbage. Only a small percentage of total decay was found in each car.

Illinois cabbage was rather severely decayed, 35 to 100% of heads affected in the 29 cars from that state.

Several badly decayed shipments of cabbage were received from Alabama, Wisconsin, Virginia, Mississippi, and Louisiana. In most of these cars the rot involved from 3 to 10 outer leaves and there was some complete decay in every car.

The cabbage from the remaining states showed varying degrees of decay, an occasional car with infection of every head.

Black mold caused by Alternaria brassicae (Berk.) Sacc.

Black mold was reported from Massachusetts, New York, Virginia, South Carolina, Georgia, Florida, Alabama, Louisiana, Texas, Ohio, Kansas, Wisconsin, and Washington. It has been rather common in South Carolina since 1909.

From the market inspectors' reports it is estimated that the greatest damage occurred while the produce was in transit and that there is not much damage from the disease while the crop is in the field. The early varieties appear to be affected most and especially those from the southern belt.

Inspection of 20 cars from Florida showed from 2 to 100% of cabbage with black mold, in most cases affecting outer 1 to 3 leaves.

Other diseases.

Rot caused by Botrytis cinerea was reported in four cars of cabbage from Florida. The average infection for the four cars was approximately 21%.

Damping off caused by Pythium de baryanum was reported from Pennsylvania where at Scranton it destroyed two million plants of different varieties. Prior to 1918 it was reported from Ohio.

Bacterial leaf spot caused by Bacterium maculicolum affected one field in New York in Madison County. No losses were suffered.

Drop caused by Sclerotinia libertiana Fckl. was reported from New York (Erie and Tompkins Counties), Alabama (Mobile County), Mississippi and Texas.

Wilt caused by Sclerotium rolfsii Sacc. was reported from Alabama where it was quite common. In Texas it was restricted in distribution and unimportant.

Malnutrition of cabbage was found locally in New York and Mississippi. As a rule it is restricted mostly to the southern states. Although the losses during 1918 from this trouble were apparently slight, in some years it is often large. The disease occurred most frequently in localities where mineral fertilizers were used. These fertilizers were used in order that a larger crop might be produced at an earlier date. No varietal resistance was reported.

Yellow leaf curl; a peculiar trouble of unknown cause, was reported from one farm in Alabama.

Oedema was common in a few fields in Cortland County, New York. No damage was done.

Calico or chlorosis was reported by J. C. Walker to have been found in Louisiana where it was affecting 30 to 50% of the plants in a local field which was broken in 1916 and had never before been planted to cabbage. Starting at one side of the field were 20 rows of Henderson's Succession variety, free from chlorosis; next were 20 rows of Early Summer also free. Next were 57 rows of Henderson's Succession, (plants from same seed bed as first lot of Henderson's Succession) showing 30 to 50% of plants badly affected with chlorosis. The grower said the field was all handled alike as to fertilizer, etc., and all planted at practically the same time.

CAULIFLOWER (See Cabbage)

CHARD

Leaf spot caused by Cercospora beticola Sacc., was reported from Missouri, Oklahoma (Local, found in September. The weather was unfavorable due to the heat and drought).

HORSERADISH

Black streak (cause undetermined) was reported from Washington. Rhizoctonia caused by Rhizoctonia sp. was reported from Washington.

KALE

Rhizoctonia was reported from Pierce County, Washington, in 1918.

KOHL-RABI

Club root caused by Plasmodiophora brassicae Wor. was reported from Connecticut. Little injury occurred.

MUSTARD

Root knot caused by Heterodera radicumicola (Græf.) Muller was found in Texas. Damage insignificant.

Club root caused by Plasmodiophora brassicae Wor., was reported from Texas. Damage negligible.

RADISH

White rust caused by Albugo candida (Pers.) Roussel was reported from Oklahoma, Indiana, Minnesota, and Nebraska. It was unimportant during 1918.

Downy mildew caused by Peronospora parasitica (Pers.) De By., was reported as local in Minnesota and causing only a trace of injury.

Rhizoctonia was found in Scioto County, Ohio.

Black rot caused by Bacterium campestris (Pam.) Erw. Sm. was found in Ohio.

Soft rot caused by Bacillus carotovorus Jones was reported occurring in New York and Maryland during 1918. In New York a trace was found on the Japanese radish. The entire contents of 20 baskets shipped from Maryland and examined at Buffalo, New York, were worthless.

TURNIP

Club root, caused by Plasmodiophora brassicae, was reported from Connecticut, Texas and Minnesota. In no case was it said to be serious.

Root knot, caused by Heterodera radicumicola, was reported as general in sandy soils in Georgia, and was found locally in Texas.

White rust, caused by Cystopus candidus, reported in small amounts in Vermont.

Downy mildew, caused by Peronospora parasitica, was observed at Harlingen, Texas, May 7.

Soft rot, caused by Bacillus carotovorus, was reported occurring in slight amounts in the field in Wisconsin and Minnesota.

DISEASES OF CUCURBITSCANTALOUPE

Leaf blight caused by Alternaria brassicae var. nigrescens.

Leaf blight was reported in 1918 from New Jersey, Dalaware, Maryland, Florida, Louisiana, Texas, Michigan and Missouri. Considering the reports of former years the range of disease includes the eastern states and Texas, Colorado, Utah and California.

The disease appeared to be less prevalent and active during 1918 than in 1917.

The greatest damage apparently occurred in Louisiana, where most of the crop was damaged, resulting in considerable loss. In Michigan this disease is the limiting factor in the growing of melons. In Missouri there was a 5% estimated local loss. During certain seasons this blight has been very destructive, especially 1905 in Maryland, Florida and Colorado.

Bordeaux has been suggested as a control as well as the practicing of rotation. The use of the latter is urged as severe attacks almost always follow if rotation is not practiced.

In Utah during 1905 it was noticed that hot, sunny weather, combined with conditions of irrigation, seemed to favor the disease to a large extent.

The rust resistant Pollack #25, put up by the Colorado Cantaloupe Growers Association, proved exceptionally resistant in Delaware during 1918. The chief difficulty observed in the resistant strains, however, was that there was a tendency to be late in fruiting and further a tendency to distribute the set of the fruit over a longer period, frequently holding the crops so late as to interfere with the use of the land for fall cropping or following crops.

Bacterial wilt caused by Bacillus tracheiphilus Erw. Sm.

Wilt was reported in 1918 from Massachusetts, New York, New Jersey, Pennsylvania, Delaware, Virginia, Kentucky, Tennessee, South Carolina, Georgia, Alabama, Texas, Ohio, Indiana, Wisconsin, Iowa, Kansas and Colorado. It was reported in former years also from West Virginia, Florida and Arkansas. It was reported not to have been found in Maine, New Hampshire, Mississippi, Oklahoma, Missouri, Montana, Wyoming, New Mexico, Nevada, Washington, and California last year.

The disease appeared to be more prevalent in 1918 than in 1917. Considerable injury was experienced in Virginia, Tennessee, Georgia, Alabama, and Ohio, while it was unimportant in New Jersey, Pennsylvania, Delaware and South Carolina.

Anthracnose caused by Colletotrichum lagenarium (Pass.) Ell. & Huls.

Anthracnose was reported in 1918 from Massachusetts, Pennsylvania, Delaware, Virginia, West Virginia, Kentucky, South Carolina, Georgia, Florida, Porto Rico, Indiana, Illinois, Wisconsin, Minnesota and Kansas. In former years it has been found also in Connecticut, New York, New Jersey, Tennessee, Arkansas and Colorado. It was reported not found last year in Maine, New Hampshire, Mississippi, Oklahoma, Missouri, Montana, Wyoming, New Mexico, Nevada, Washington and California.

Considerable crop injury occurred in Pennsylvania (Estimated loss 3-4%), Georgia (10% injury in individual fields and 40% of melons in 2 cars inspected at markets showed anthracnose), and Minnesota (Estimated loss about 1%).

The Honey Dew melon was the most susceptible in parts of Georgia while other cantaloupes in the same fields were little affected.

Downy mildew caused by Pseudoperonospora cubensis (B. & C.) Rostow.

This disease was reported in 1918 from Massachusetts, New York, New Jersey, Virginia, South Carolina, and Colorado. It was found previous to 1918 in Connecticut, Pennsylvania, West Virginia, Kentucky, Georgia, Florida, Louisiana and Wisconsin. It was reported not to have been found in Maine, New Hampshire, Tennessee, Mississippi, Oklahoma, Indiana, Minnesota, Missouri, Kansas, Montana, Wyoming, New Mexico, Nevada, Washington, and California.

The prevalence in 1918 was somewhat less than in former years. In New Jersey and South Carolina it was common.

Sclerotium stem rot caused by Sclerotium rolfsii Sacc.

This disease was reported in 1918 from Georgia and Texas. Reported in former years from South Carolina and Ohio.

In Georgia the disease was local, producing about 10% crop injury in an individual field. This trouble may be quite common over the state, due to the fact that it is associated with the melon worm and the damage ascribed to the worm may often be done by this fungus.

Wilt caused by Fusarium vasinfectum Atk.

Fusarium wilt was reported from Delaware, Georgia, Mississippi, Ohio, and Minnesota. On the whole it was not prevalent except in Ohio where it was widespread. But for a local 25% injury in Georgia, the injury was slight.

Wilt caused by F. vasinfectum var. niveum was found during 1918 in New Mexico where it was as prevalent but less severe than in 1917. In Roosevelt County it became so serious that cantaloupe growing had to be practically abandoned.

Other diseases.

Root knot caused by Heterodera radicicola (Greef.) Muller was not reported in any state during 1918. Records of previous years show it to have been present throughout the South, (Tennessee, North Carolina, South Carolina, Florida, Alabama, Mississippi). Usually causes little injury.

Fruit rot apparently due to a species of Fusarium was reported from Maryland. It appeared in market gardens near Baltimore. It was present in the fields before the melons were gathered and spread rapidly after harvesting, greatly reducing the market value of the fruit.

CUCUMBER

Bacterial wilt caused by Bacillus tracheiphilus E. F. S.

This was probably the most serious cucumber disease last year, although mosaic ranked a close second. It was reported from sixteen states, mostly in the East, as follows: Massachusetts, New York, Pennsylvania, Virginia, Tennessee, South Carolina, Texas, Ohio, Michigan, Iowa, Wisconsin, Minnesota, Kansas, Colorado, Mississippi and Illinois.

In Michigan, Wisconsin, Minnesota and Kansas it was said to be too dry for the favorable development of wilt. In states further east, however, it was more destructive. Pennsylvania reported 3-5% crop loss, and Virginia called it the worst cucumber disease in the state. New York also reported damage in cucumber sections.

It was reported as first appearing in the field as follows:

June 10..... Mississippi	August 7..... Minnesota
July 9..... Kansas	August 9..... Pennsylvania

Mosaic (cause undetermined)

In 1918 mosaic was reported from the following states: Massachusetts, Connecticut, New York, Pennsylvania, New Jersey, South Carolina, Georgia, Mississippi, Louisiana, Texas, Ohio, Indiana, Michigan, Wisconsin, and Minnesota. A questionable report was also received from the state of Washington. In years previous to 1918 it has been reported from the additional states of Vermont, Rhode Island, Illinois, Iowa, Kansas, Colorado and California.

Mosaic seems to be increasing from year to year both in its range and destructiveness. In Wisconsin it is at the present time the limiting factor in the pickle industry. In Michigan cases were reported where the entire crop was ruined. In Pennsylvania a field of Davis White Spine variety having 75% affected vines was reported a failure. In Massachusetts from 10% to 75% loss was reported in the gardens about North Lexington and Springfield.

The disease was reported as first being noticed as follows:

May 4..... Louisiana	July..... Wisconsin
June 14..... Minnesota	August 9..... Massachusetts
July 14..... Indiana	August 21..... Pennsylvania

Anthracnose caused by Colletotrichum lagenarium (Pass.) Ell. & Halls.

Anthracnose was reported from Maine, Massachusetts, Pennsylvania, New Jersey, South Carolina, Florida, Alabama, Louisiana, Ohio, Wisconsin, Minnesota and California. The report from California is the first received by the Survey from any state west of Colorado.

It occurred in less amounts than usual in the commercial pickle fields of Michigan, Wisconsin, and Minnesota. This was largely due to the extremely dry weather which, although reducing the damage from anthracnose, was in itself injurious to the crop.

In the New England States the disease occurred mostly or entirely in the greenhouses in May and June. It was reported for the first time for Maine in 1917 when it was present in greenhouse and fields in the vicinity of Portland. It was reported in 1918 from Louisiana in the vicinity of New Orleans where cucumbers were started under glass. Although not much damage to fruit

in the southern fields is reported, inspections of carload lots at some of the larger markets show a considerable amount of disease present in some of the shipments from the South.

The disease is reported as first appearing on the following dates:

May 15 (greenhouse).... Massachusetts	June 29..... Minnesota
June (greenhouse)..... Maine	August 21.... Pennsylvania
June 28..... New York	August..... Wisconsin

Bordeaux mixture (4-5-50) thoroughly and frequently applied was reported effective in Massachusetts and Ohio, and seed disinfection and crop rotation are proving satisfactory in Wisconsin.

Downy mildew caused by Pseudoperonospora cubensis (B. & C.) Rostow.

Downy mildew was reported from New York, New Jersey, West Virginia, South Carolina, Florida, Porto Rico, Ohio, Wisconsin and California.

It was most serious in the South, particularly in Florida and Porto Rico. In the former state perhaps 25% of the crop was affected but as harvest was practically over at the time when the disease was worst, little loss resulted. Spraying was effective in Florida when the application was thorough and timely.

Angular leaf spot caused by Bacterium lachrymans E. F. S. & Bryan.

Angular leaf spot was reported as follows: South Carolina (Local), Ohio, Louisiana (Slight amounts locally May 4), Wisconsin (Less than usual, weather too dry, first appeared in August), Michigan (Seen but apparently not common).

During years prior to 1918 it has been reported from the following additional states: New York, Connecticut, Virginia, Georgia, Florida, Alabama, Indiana, Illinois, Minnesota, Iowa and Colorado.

Scab caused by Cladosporium cucumerinum Ell. & Arth.

Scab was reported from Maine (Second case in thirteen years), South Carolina, Louisiana (Market inspection), Ohio, Wisconsin (Less than usual, scattered, reported August 30), and California.

Other diseases.

A root and stem rot, caused by Sclerotinia libertiana, was reported from Massachusetts (General in greenhouses and occasionally out of doors), New Jersey (Severe under glass due to failure to sterilize soil), and Ohio. This fungus was also found causing a rot of the fruit in carlot shipments from South Carolina, Texas, Illinois and other states. The decay ranged from slight to 90% of the contents of car.

Root knot, caused by Heterodera radicicola, was reported from Texas (Common) and Ohio.

Wilt, reported as being due to Fusarium sp., was severe locally in New Mexico and local in Ohio.

Stem rot, thought to be caused by Sclerotium sp., was found in Pennsylvania in a few places, notably in Erie County.

Rhizoctonia sp. was reported from Ohio and Washington.

Chlorosis was reported from King County, Washington.

Powdery mildew, caused by Erysiphe cichoracearum, was reported from Washington.

Dodder (Cuscuta sp.) was reported from Westchester County, New York, July 7.

PUMPKIN

Bacterial wilt, caused by Bacillus tracheiphilus Erw. Sm., was reported from Ohio.

Sterility, cause unknown, was reported from Washington.

SQUASH

Rot, caused by Alternaria sp., was reported from Washington.

Wilt, caused by Fusarium sp., was reported from Texas (Common, 40% estimated loss).

Root knot, caused by Heterodera radicicola (Greef.) Muller, was reported from Texas.

Downy mildew, caused by Pseudoperonospora cubensis (B. & C.) Rostow was reported from Porto Rico.

Sterility, cause undetermined, was reported from Washington.

Mosaic was reported from Texas as doing a large amount of damage to the crop locally, and from Connecticut.

Bacterial wilt, caused by Bacillus tracheiphilus Erw. Sm., was reported from Ohio and Colorado. In the latter state it was severe around Greeley where it did most damage in the gardens. Some fields were partially destroyed.

Scab, caused by Cladosporium cucumerinum Ell. & Arth., was reported from Maine.

Fruit rot, caused by Choanephora cucurbitarum, was reported from Massachusetts (General) and Porto Rico.

WATERMELON

Anthracnose caused by Colletotrichum lagenarium (Pers.) R. & H.

Anthracnose was reported from New Jersey, West Virginia, South Carolina, Georgia, Florida, Alabama, Oklahoma, Arkansas, Ohio, Indiana, Illinois, Iowa, Missouri, Arkansas and Kansas. Apparently the disease occurred in about the usual amounts although reports from Florida, Illinois and Kansas indicate that it was less abundant than normally in those states. In the latter state hot, dry weather in August was believed to be the cause of the small amount, at least about Manhattan.

The following field losses were reported: Arkansas, 2% crop injury; Georgia, 10% infection; Missouri, 25% crop injury; South Carolina, 10% injury,

The following table gives one an idea of the amount of anthracnose found on watermelons in cars arriving in city markets. It should be remembered that only a small percentage of cars are inspected and that of those inspected not all showed the presence of anthracnose.

Table X. Percentage of anthracnose as shown by examination of cars at destination by inspectors of the Bureau of Markets.

Origin of shipment	No. of cars : :with anthrac: :nose	Percentage of : :anthracnose :	Remarks
Delaware	1	---	Occasional melon spotted.
Florida	6	2 cars 85-93%	Advanced stage.
		4 " 9%	Mostly early stage, in small spots.
Georgia	41	3 " 100%	From spots to entire surface of
		7 " 60%	melon covered.
			Usually in small spots.
Missouri	1	---	Badly specked.
North Carolina	3	2 cars 78-87%	Advanced stage, badly spotted.
		1 " 16%	Slight to bad.
Ohio	1	---	Occasional melon slightly spotted.
South Carolina	10	2 cars 100%	Advanced stage, deeply spotted.
		2 " 55%	Badly spotted, advanced stage.
		6 " 15%	Slight, early stage.
Texas	1	30%	20% bad, 10% slight anthracnose.
Virginia	1	42%	Badly spotted.
Origin unknown	15	4 cars 100%	Spots covering most of surface of
			melon.
		11 " 10-15%	Slight to bad.

End rot caused by Diplodia sp.

End rot was reported by collaborators from the following states:- Tennessee, South Carolina, Georgia, Florida, Mississippi, Louisiana, Arkansas, Missouri and Kansas. It was reported both as a blossom end and a stem end rot.

The loss in the vicinity of Manhattan, Kansas, was placed at 7-8%; in Missouri 5% of the crop was estimated injured; in South Carolina 5-10% loss was reported; and in Tennessee 10% damage is estimated. The following table represents losses in the lot shipment.

Table XI. Percentages of stem end rot as found by inspection of cars by the Bureau of Markets at the various northern markets.

Origin of shipment	No. of cars : :with stem :end rot	Percentage of : :stem end rot :	Remarks as to seriousness of decay
Delaware	1	4%	-----
Florida	11	1 car 58%	20% complete decay, 38% slight.
		4 " 33%	Decay slight in most cases.
		6 " 10%	Mostly slight.
Georgia	56	12 " 57%	Very heavy decay, some worthless.
		10 " 28%	Decay frequently had progressed.
			4 inches from stem.

Origin of shipment	No. of cars : :with anthrac: :nose	Percentage of : : anthracnose : :	Remarks
		34 cars 6%	Slight, early stages.
Missouri	6	1 " 35%	
		5 " 13%	
North Carolina	3	9%	Early stage, not yet leaking.
Ohio	1	---	Early stage.
South Carolina	10	8 cars 15%	Decay heavy in 1 car only.
		2 " 6%	
Texas	4	1 " 50%	Most melons completely decayed.
		1 " 33%	Well developed, bad decay.
		2 " 12%	Well developed.
Virginia	1	40%	Varying from slight to bad decay.
Origin unknown	25	1 " 100%	Well advanced stage.
		6 " 30%	Well developed.
		18 " 8%	Mostly slight, some bad decay.

Wilt caused by Fusarium vasinfectum.

Wilt in 1918 was reported from Maryland, Virginia, Tennessee, South Carolina, Georgia, Mississippi, Louisiana, Texas, Indiana, Missouri and New Mexico. It was general throughout Georgia and New Mexico (Only watermelon disease in the state). It was scattered in Virginia and in Missouri it was general in the southeastern section of the state. In the remaining states the disease was local in occurrence.

The losses were very severe in Texas (30%). In Georgia the crop injury was about 25% with an estimated loss of 5%; in South Carolina the injury was 5% and loss 1%; in Indiana locally very severe; in Missouri about 10% crop injury.

Rot caused by Fusarium spp.

A Fusarium rot was reported from Kansas. The greatest damage to the melon crop in the state was said to be caused by this trouble wherever melons were grown commercially. The losses ranged from 3-33% but ranged on the average between 10-12%.

Other diseases.

Bacterial wilt, caused by Bacillus tracheiphilus, was reported from South Carolina. The occurrence was local.

Leaf spot, caused by Cercospora citrullina, was reported from Texas and Santo Domingo.

Downy mildew, caused by Pseudoperonospora cubensis, was reported from South Carolina (local).

Alternaria leaf spot, caused by Alternaria sp., was observed in Georgia, Louisiana and Ohio, of slight importance in each case.

Blight, caused by Sclerotium rolfsii, was reported from South Carolina.

Nematode caused considerable damage in local fields in Texas and

Dry weather was the limiting factor in Arkansas for the growing of watermelons.

Frost injury was reported from Florida as slight.

DISEASES OF MISCELLANEOUS CROPS

ARTICHOKE

Blight, caused by Sclerotium rolfsii Sacc., was found in many home gardens throughout Georgia during 1918. In patches where the disease occurred all the plants were usually destroyed. One garden in the vicinity of Athens had been planted in 1917 to Spanish peanuts which developed about 25% wilt (Sclerotium rolfsii). Artichokes planted on the same area in 1918 were destroyed. The loss for the state was a trace. The trouble was noticed July 1.

Rust, caused by Puccinia helianthi, was abundant on wilt artichokes growing along the Monongehala River in Monongalia County, West Virginia. Some was also found on cultivated plants in the same county.

A brown rot, caused by Botrytis sp., was found in 2 cars of artichokes inspected at Buffalo which had been shipped from California. There was about a 41% infection, with many boxes entirely worthless in one car while the infection in the second car ranged from 10 to 75%.

ASPARAGUS

Rust caused by Puccinia asparagi DC.

The only disease which affected the asparagus crop to any extent, and then only moderately, was rust. It appeared scatteringly from the Atlantic to the Pacific Coast and from the northern to the southern states.

It was reported from Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, West Virginia, Kentucky, South Carolina, Georgia, Texas, Indiana, Illinois, Wisconsin, Minnesota, Missouri, Kansas, Washington and California. It was reported not to have been noticed during 1918 in the following states: Virginia, Tennessee, Louisiana, Montana, Wyoming, Nevada, and Oregon. In previous years it has been reported also from Maine, New Hampshire, Mississippi, Oklahoma, Arkansas, Missouri, New Mexico and Washington.

In Massachusetts there was a probable loss of 2%. The resistant varieties (Washington) developed by the United States Department of Agriculture was reported everywhere as giving fine results.

Other diseases

Fasciation was reported as doing some damage but causing very little loss in Connecticut. Growers in California have experience trouble from the same source in the past. Some growers there have testified that there was a greater percentage of fasciated shoots in their beds during the period

when the first stems pierced the soil, especially after a cold winter. Doubtless this has appeared in other sections of the country but the producer or grower merely looked upon it as an abnormality, and as it may not at times affect the selling value, when appearing slightly, it has gone unreported. It has been suggested that over manuring and too much moisture at the early growing season may induce fasciation.

Rhizoctonia was reported from Pennsylvania (local) and Washington (Of slight consequence).

BEET (Garden)

Scab, caused by Actinomyces chromogenus Gasp., occurred locally in Vermont, Connecticut, New York, Ohio, and Washington. The disease was of slight importance in these states. In Vermont, however, 25% of the beets were reported scabby.

Leaf spot, caused by Cercospora beticola Sacc., was general in New York, New Jersey, South Carolina, Texas, Ohio, Minnesota, and Colorado. It appeared in slight amounts in Connecticut, West Virginia, Georgia, Porto Rico, Oklahoma, and Missouri. Considerable injury was reported from New York, South Carolina, Georgia, and Colorado.

Rot, caused by Sclerotinia libertiana Fekl., was reported from Illinois.

Root knot, caused by Heterodera radicum (Greef.) Muller, was reported from Texas where it occurred locally and in slight amounts.

Curly top was reported from Nevada and Washington.

A strikingly peculiar leaf spot, the cause of which was undetermined, was reported by L. R. Hesler to have been found May 2 in a field near Austin, Texas.

CARROT

Soft rot, caused by Sclerotinia sp., was found in certain localities in Pennsylvania where the crop was stored in trenches (75% loss) and where the roots were set out in the field to develop seed (25% loss). Appeared April 17 in Philadelphia County.

Rot, caused by Sclerotinia libertiana Fekl., was the cause of considerable decay of root and tops in transit according to reports of inspectors of the Bureau of Markets.

Gray mold, caused by Botrytis sp., was found in Pennsylvania where a 10% loss occurred locally on stalks of seed carrots. The tops turned brown, died and then Botrytis developed. It was reported July 17. It was also found at Pullman, Washington.

Corticium vagum, var. solani Burt, was found in New York wherever carrots were grown. Also found in Pierce County, Washington.

Soft rot, caused by Bacillus carotovorus Jones, was reported found in Massachusetts (general), Mississippi, Louisiana, Oklahoma (trace found in October) and Minnesota (trace).

CASTOR BEAN

Gray mold caused by Botrytis sp.

According to H. E. Stevens, this recently introduced disease is very serious on castor beans in Florida. It was evidently brought in on the seed. Subsequently it was distributed over the state, and since a large acreage has been given over to the raising of castor bean recently the disease has become very prevalent. At least 50% of the crop was destroyed last year.

It appeared during the rainy season and rapidly became epidemic in the fields. Under moist conditions the disease makes rapid progress and practically all fruiting heads on a plant that were not nearly mature when the disease appeared were quickly destroyed by it.

Practically all varieties are susceptible, varieties which mature early or ripen their seeds before the spring rains escape.

No ordinary methods of control seem to be of any use, the only possible means at present is the planting of early maturing varieties.

Other diseases

Root rot due to an excessive amount of alkali in the soil caused considerable loss on a farm near Laredo, Texas. The beans either failed to make growth or died after attaining some growth. On the outside area of the main alkali spot the plants would grow and sometimes attain a height of 10 to 15 feet but in such instances they would go all to vines and produce no seed.

Texas root rot, caused by Ozonium omnivorum Shear, was common in Texas where it produced an estimated loss of about 2%.

Leaf spot, caused by Cercospora ricinellae, was reported from Santo Domingo where it was of minor importance.

CELERY

Late blight caused by Septoria petroselinii Desm. var. apii Br. & Cav.

In 1918 late blight occurred in New Hampshire, Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Virginia, South Carolina, Florida, Texas, Ohio, Illinois, Missouri, Michigan, Wisconsin, North Dakota, Montana, Colorado, Utah, Washington and California. It was reported as not being found in Tennessee, Georgia, Mississippi, Oklahoma, Wyoming and Nevada. The disease was found prior to 1918 in the additional states of Maine, West Virginia, Kentucky, Louisiana, Arkansas, Indiana, Minnesota, Missouri, Kansas and Oregon. South Carolina and Missouri reported the finding of late blight for the first time.

Late blight seemed to be somewhat less prevalent during 1918 than in 1917. The losses were also correspondingly fewer. In Massachusetts it was general and especially severe in the eastern part of the state where there was a 10% loss. In New Jersey it was abundant and the cause of considerable loss in some localities. In Pennsylvania the loss was about 5%.

In Missouri there was a 25% injury to the celery crop in Boone County. In Michigan it was less than usual, with only a trace lost. In Colorado late

blight was rather prevalent and the greatest losses occurred in Pueblo and Fremont County.

Michigan reported that in 1915 the loss from late blight of celery amounted to probably more than one million dollars. In California (1908) the estimated loss in money was \$550,000 and in quantity 1950 carloads.

Golden Self Blanching and Giant Pascal were quite susceptible to the disease in Massachusetts, while in Pennsylvania the same held true for Golden Self Blanching. Easy Blanching was much more resistant.

Bordeaux mixture has been successful in most cases as a means of control. According to J. E. Howitt, of Canada, the results of five years experimentation showed Bordeaux mixture (4-4-40) to be effective. Spraying is commenced when the plants are in the seed bed and continued at intervals of a week or ten days, or even twice a week, if necessary. It is said that this can be continued within two or three days of the time when the celery is to be harvested, as the subsequent washing removes the fungicide.

Early blight caused by Cercospora apii Fr.

Early blight was apparently less prevalent and caused less injury in 1918 than in 1917. The disease was present in Vermont, Massachusetts, Connecticut, New York, New Jersey, South Carolina, Florida, Michigan, Minnesota, Colorado and Utah. The disease has been reported at some previous time from Maine, West Virginia, Kentucky, Arkansas, Indiana, Missouri, North Dakota, Kansas and California.

The chief loss was through reduction in market value due to blighted leaves and probably through reducing the keeping qualities during transportation. In Vermont all the early varieties were reported affected. In Massachusetts the disease was much less severe than in 1917, about a 4% loss. In New York, Michigan, Colorado, and Utah it was unimportant. In Connecticut there was considerable loss. In New Jersey it was abundant and considerable loss resulted. It was general in Florida and the most conspicuous disease seen there by L. R. Mesler while making a survey of the crop diseases from March 12-31. It was found in all celery regions of the state visited. It often browned whole fields. In Minnesota the loss was below 1%. Michigan and Utah had only a trace.

Varietal susceptibility was manifested by the Salzer Easy Blanching and the Golden Self Blanching in Connecticut.

Bordeaux gave good results in Massachusetts, New York and New Jersey. It is practiced in Florida but in the majority of cases it did not seem to hold the fungus in check.

Foot rot caused by Sclerotinia libertiana Fckl.

Foot rot was reported found in Massachusetts, New York, New Jersey, Florida, Michigan, Ohio, Utah and California. In Massachusetts it did not appear until after boarding for blanching, and in Michigan it appeared as a trench rot. There is given below a table showing the amount of rot, thought by inspectors to be due to Sclerotinia, which was found on celery in transportation.

Table XII. Percentages of watery soft rot as shown by inspection of cars by the Bureau of Markets.

Origin of shipment	No. of cars with decay	Percentage of decay	Remarks as to seriousness of decay
California	5	2 cars 80%+	Slight to bad, 25% total decay in 1 car, balance slightly decayed.
		3 " 50%	On outer branches in all cars.
Colorado	1	---	Occasional stalk showing white mold.
Florida	9	1 car 100%	Badly decayed.
		1 " 50%	Slight in some crates, celery in other crates worthless from decay.
		4 " 20%	Celery in top layers badly decayed, slightly less at bottom of load.
		3 " 5%	Generally slight decay.
Illinois	1	---	Top layer worthless, balance slight.
Michigan	4	2 cars 100%	Slight in 1 car. Decay entering heart of bunches in the other car.
		2 " 10-20%	Affecting 1 to 4 leaves per stalk.
New York	4	2 " 100%	Bad decay in all stalks.
		2 " ---	Affecting occasional stalk.

Bacterial rots

Various rots caused by bacteria were reported on celery in the field in various states. Crown rots were reported from Massachusetts, New Jersey, and Missouri. Heart rot was reported from Massachusetts. Root Rot (New Jersey), and soft rot (Michigan, Ohio, Porto Rico), were also reported. In Massachusetts Osmun and Krout report that celery is almost a complete failure on some farms because of the severity of crown rot and heart rot. Growers are substituting other varieties for the Golden Self Blanching because of the susceptibility of this variety to the diseases. The new Easy Bleacher in Massachusetts is almost immune. In Missouri Golden Self Blanching was severely affected with a soft crown rot, while varieties Pascal and Winter Queen were not affected. In Michigan, Easy Bleacher was reported as showing 6% bacterial soft rot in one field.

Bacterial leaf spot (cause undetermined)

This leaf spot was only reported with certainty from New York and Michigan. The disease was general in both of these states. In New York it occurred practically everywhere celery was grown, especially in the western part of the state, while in Michigan, all the yellow celery, particularly the Golden Self Blanching, seemed to be affected. It was estimated that on account of the excessive trimming of the leaves required in Michigan 5% loss of the susceptible variety occurred. Spraying with Fordeaux gave excellent results in New York.

Black heart (Cause undetermined).

Black heart was reported from Florida, Louisiana, and California. In Florida traces were noted at Plant City, Bradentown and Manatee, and a heavy outbreak was observed at Sanford. From estimates made in the field during harvest at Sanford it was found that about 20% of the bunches had to be discarded as non-marketable on account of black heart. Certain shipments of celery from California into Huston, Texas, showed an advanced stage of black heart. One car of New York celery showed 100% black heart. Florida celery was less decayed, about 12% affected hearts. In a car of celery of unknown origin 30% of the bunches were affected by black heart.

Slimy soft rot caused by Bacillus carotovorus and related bacteria.

Slimy soft rot was a common disease of celery in transit. The accompanying table shows the results of market inspection.

Table XIII. Percentages of slimy soft rot of celery as determined by market inspection of car loads, 1918.

Origin of shipment	No. of cars with decay	Percentage of decay	Remarks as to seriousness of decay
California	3	1 car 66%	A mass of decay in upper part of stalks and leaves.
		1 " 53%	Decay varying from slight to bad.
		---	Decay varying from an occasional stalk in bottom layer to 50% in top.
Florida	8	1 car 50%	Very heavy decay at top of load.
		1 " 33%	Decayed in stalk and leaking badly.
		4 " 15%	Some decay extending into heart.
		2 " 5%	Decay in outer stalks and tops.
Kentucky	1	---	Top layer worthless, decay less in lower layers.
Michigan	5	1 car 100%	Slimy decay of leaves and tops of stalks.
		4 cars 25%	Decay very heavy in top layer of crates, slight at bottom of load.
New York	4	2 " 25%	Heavy decay in upper 2 layers of crates, less in lower layers.
		2 " --	Occasional decayed stalk.
Ohio	1	25-100%	Much total decay at top of load, occasional decayed stalk at bottom.
Pennsylvania	1	35%	Decayed stalks black at heart.

Other diseases

Rhizoctonia was unimportant. It appeared in Massachusetts at various times and also in Ohio and in Washington (Moderately severe in Pierce County).

Root knot, caused by Heterodera radicicola (Greef.) Muller, was reported from Reno County, Kansas, as severe.

Mosaic was reported by W. L. Doran to have been found by him while visiting market gardens in Massachusetts in September, 1918.

Soft rot, probably caused by Botrytis sp., was reported from Pennsylvania. It was very severe on a carload of bunched celery in crates.

Drought injury caused the greatest damage to the celery crop in Wisconsin. The garden crop was very small.

Scab, caused by Phoma apiicola Speg., was recorded on celery from Ohio.

Leaf spot, caused by Phyllosticta sp., was found in Porto Rico. The case reported occurred where soil conditions were unfavorable for satisfactory growth of the host.

EGGPLANT

Fruit rot caused by Phomopsis vexans (Sacc. & Syd.) Harter.

During 1918 fruit rot was reported from New York, New Jersey, Tennessee, Georgia, Florida, Porto Rico, Mississippi, Louisiana, Texas, Oklahoma, Ohio, Illinois, Wisconsin, Iowa, and Missouri. Four states reported the disease for the first time to the Survey (Tennessee, Georgia, Iowa, and Missouri). In years previous to 1918 Phomopsis fruit rot has been reported from the following additional states, - Connecticut, Pennsylvania, Virginia, West Virginia, Kentucky, and Arkansas. Negative reports of occurrence in 1918 were received from the following states, - Maine, New Hampshire, Massachusetts, South Carolina, Minnesota, Kansas, Montana, Wyoming, Colorado, Nevada, Washington and California. So far it has not been reported from the West.

When reports of former years are combined with those of 1918 three main regions of infestation stand out rather prominently. (1) The section along the Atlantic Coast from New York to Virginia. (2) The group of Southern and Gulf Coast States from Georgia and Florida westward to Oklahoma. (3) The strip of Central States from Ohio to Nebraska.

The greatest losses seem to have been experienced in New Jersey, Virginia, Florida, Alabama, and Louisiana.

Resistant varieties have not been reported. In Pennsylvania in 1917 the Black Dinah was seriously affected.

According to reports no real successful control measures are available. Bordeaux was reported in 1915 as giving good results in New Jersey but apparently it was not satisfactory in Virginia or Louisiana. Seed disinfection, soil sterilization, and crop rotation are recommended in Florida.

Bacterial wilt caused by Bacillus solanacearum E. F. Sm.

This disease caused some loss during 1918 and seemed to be quite local in distribution, being reported only in Pennsylvania, Porto Rico, and Texas. In Pennsylvania it was general, where the crop was grown producing an estimated loss of 10%. In Porto Rico it was the most severe eggplant disease of the year, and in Texas also it was the greatest drawback to the eggplant crop. The variety Beauty was reported very susceptible.

Leaf spot caused by Alternaria sp. or Macrosporium sp.

This leaf spot was found in 1918 at Eden, Erie County, New York, where it appeared May 13, killing most of one of the grower's seedlings. It was also reported locally from Kansas, September 13, but was of little consequence.

During 1908 specimens were collected in a small field at Kenilworth, Maryland, where the disease was quite prevalent on the lower leaves of most of the plants in the field. In 1916 it was reported from Prince George County, Maryland. In 1915 it was reported from Wisconsin, and in 1916 again from the same state where it caused serious injury to the seed beds at Eau Claire.

Verticillium wilt caused by Verticillium sp.

Wilt appeared to be limited in distribution to the Atlantic Coast Region from New York to Georgia. It caused considerable injury and loss wherever it appeared.

It was present in Massachusetts, New York, New Jersey, Virginia, South Carolina, and Georgia. Reported not to have been noticed in Maine, New Hampshire, Pennsylvania, West Virginia, Tennessee, Florida, Mississippi, Louisiana, Arkansas, Indiana, Wisconsin, Minnesota, Missouri, Kansas, Montana, Wyoming, Colorado, Nevada, and Washington. A similar disease has been found previous to 1918 also in Connecticut, Kentucky, Texas and California.

Other diseases

Dodder (Cuscuta sp.) An interesting case of dodder parasitism was reported from Pennsylvania. It appeared on an eggplant crop in a large patch planted on new ground which previously had been wooded. The plants were dwarfed and produced no fruit. In one case reported there was a 50% loss.

A report in 1908 from Virginia states that an entire crop was lost from the same cause.

Root knot, caused by Heterodera radiculicola (Greef.) Muller, was reported from South Carolina where it was found in Florence, Charleston and Beaufort Counties. In Texas a 5% loss occurred on a truck farm in the vicinity of Fort Worth.

Crown rot, caused by Sclerotium rolfsii Sacc., was observed in Porto Rico during 1918. It caused some damage. It was reported also in 1916 in Tangipahoa Parish, Louisiana.

Fruit rot, cause undetermined, was reported from Florida in the form of an Alternaria-like spot on the fruit. Spots were about 1/2" in diameter, raised, hard, and with conspicuous concentric rings. The disease was observed in markets on March 19 and at Jacksonville on April 8.

Fusarium wilt, caused by Fusarium sp., was reported from Georgia and New Mexico (Slight loss in Dona Ana County).

Root rot, caused by Rhizoctonia sp., was reported from New Jersey where it was severe and destructive in some plantings.

GANDUL

Leaf spot, caused by Cercospora daiana P. Henn., was common in Porto Rico.

Pink disease, caused by Corticium salmonicolor B. & Br., was reported from Porto Rico.

HORSE BEAN

Stem rot, the cause of which was uncertain, was reported from Washington.

Leaf spot, cause undetermined, was reported from Washington.

LETTUCE

Drop caused by Sclerotinia libertiana Fekl.

Drop was apparently the worst disease of lettuce during 1918. It was found wherever the crop was grown. It was reported severe and prevalent in Massachusetts, the South Atlantic States, Arkansas, Iowa and Oregon. Traces were observed in Mississippi, Texas and Colorado.

In Pennsylvania the early summer crop seemed to escape the disease to some extent but the late crop was severely hit bringing about an estimated loss of about 25%. In Massachusetts during the winter and early spring it was severe in the greenhouses where in some houses 50% of the crop was ruined; one house was practically a total failure. The average loss of the greenhouse crop ranged from 8-10%, while in a few instances the out-door crop was severely injured. The total loss was not over 2%.

In New Jersey, L. M. Massey found this disease on the coast farms in Bergen County where in some cases the loss was 25%.

In Florida during the early part of the season, when the weather was somewhat dry and exceptionally cool, drop was less troublesome than in seasons past but in December numerous fields showed a considerable percentage of affected heads.

In the greenhouses at Des Moines and Muscatine, Iowa, Sclerotinia was very destructive.

The Blue Ribbon was especially susceptible to drop in New York while in the same state May King was not so badly affected.

Gray mold rot caused by Botrytis cinerea Pers.

In 1918 gray mold was reported from Massachusetts, New York, Pennsylvania, Arkansas and Ohio. Apparently the amount of loss was higher and the disease was more prevalent than in 1917. In New York as high as 9% was found in one field but on the whole it was less serious than 1917, the average infection for the state being not over 2%. In Ohio it was observed to be very bad on head lettuce, destroying 98% of the plantings in a Cleveland garden. In was found to be general in greenhouses throughout Massachusetts where a 1% loss was estimated. In parts of Pennsylvania

a loss of about 20% occurred. The growers did not appear to take the disease seriously, two fields suffered 48 and 60% respectively. In Arkansas a 5% loss was reported.

Downy mildew caused by Bremia lactucae Regel.

Downy mildew appeared in slight amounts in Massachusetts, Pennsylvania, Arkansas, Ohio, Iowa, Oregon and was severe locally in New York. It occurred for the most part in the greenhouses although some was found in the field.

Control of growing conditions are recommended by collaborators in Massachusetts and Ohio. In the latter state eradication measures and steam sterilization have been used with success.

Stem rot and rosette caused by Rhizoctonia sp.

Stem rot was found scattered throughout the eastern and southern United States in 1918. In the head-lettuce section about Baltimore, Maryland, examinations showed from 1-5% stem rot. In the Sanford section, Florida, a decay which started on the lower leaves where they rested on the ground and which gradually worked up into the head, caused noticeable losses. It made some heads entirely useless while others through necessary trimming were reduced in size. In New York the same decay caused losses perhaps greater than those in the Sanford truck section of Florida yet it was less severe during 1918 than 1917. In Pennsylvania it is generally prevalent causing a loss of about 2%. It was reported as unimportant in Texas and not found in Mississippi.

Rosette was general in Pennsylvania and caused a loss of about 5%. The disease is overlooked to quite an extent because the plants may grow out of the typical rosette symptoms. At State College it was perfectly controlled in the greenhouses by steam sterilization. The disease was less serious in New York than in 1917 as the actual loss was small in most of the fields.

Tip burn (non-parasitic)

In 1918 tip burn was reported from Massachusetts, Pennsylvania and Louisiana. In Massachusetts it was common and serious in greenhouses. In Pennsylvania it appeared in Alleghany County where it produced a 20% loss to the crop. In Louisiana, J. C. Walker reported that in the New Orleans section in May the disease became very serious just as the lettuce was to be out. It was probably brought on by the warm weather which prevailed at that time. There were no reports of the disease during 1917 to the Plant Disease Survey but has been reported in former years from Pennsylvania, Maryland and Ohio.

Rio Grande Disease (cause undetermined)

Rio Grande disease was reported by J. C. Walker May 9, 1918 as occurring in Louisiana. Later Walker and Gardner observed it in the Chicago market gardens where it occurred locally in slight amounts.

Other Diseases and Injuries Reported in 1918.

Shot hole, caused by Marssoria panattoniana (Berl.) Mag. - New York.

Fusarium sp. - Ohio.

Root knot, caused by Heterodera radiculicola - Arkansas, Florida and Ohio.

Leaf spot, caused by Septoria lactucae Pass. - Arkansas, Florida, Mississippi, New York, Pennsylvania.

Brown mold - Pennsylvania.

Damping off - New Jersey.

Firing, (probably bacterial) - Pennsylvania.

Leaf spot, caused by Cercospora lactucae Stevenson - Porto Rico.

Head rot - Tennessee.

Bacterial leaf rot - Texas and Ohio.

Soft rot, bacterial - Pennsylvania.

Slimy soft rot, caused by Bacillus carotovorus Jones - Alabama, California, Colorado, Florida, Illinois, Kentucky, Louisiana, Maryland, Missouri, New York, Ohio, Pennsylvania and South Carolina.

LIMA BEAN

Pod blight, caused by Phoma subcircinata E. & E., was reported from Georgia. It made its appearance in certain localities, destroying from 20 to 25% of the crop in some cases. When dry weather came on the disease appeared to abate.

Pod blight, caused by Diaporthe phaseolorum, occurred in Alabama where it was common and caused complete losses at times in some localities. Found in gardens only.

Rust, caused by Uromyces appendiculatus (Pers.) Lev., was reported from Ohio and California. In Ohio it was rather abundant. In California it was said to be severe and caused considerable loss.

Anthracnose, caused by Colletotrichum lindemuthianum, was present in Pennsylvania. It appeared to chiefly attack the leaves. There was only a slight loss.

Bacterial blight, caused by Bacterium phaseoli E. F. Sm., was reported from Georgia.

Leaf spot, caused by Phyllosticta phaseolina Sacc., was observed in Michigan in Branch and Ingham Counties. It was of minor importance.

Mildew, caused by Erysiphe polygoni D.C., was reported from California and Porto Rico. In California it is one of the main pathological problems of the bean growing sections around Ventura and Santa Barbara Counties and other bean sections of the central and southern portions of the state. Also considerable mildew is found along the coast.

Downy mildew, caused by Phytophthora phaseoli Thax., was reported from Pennsylvania and Virginia. In Pennsylvania it was less prevalent in 1918 than 1917 and caused some slight loss. In Virginia it was severe locally in Montgomery County where about 50% of the crop was injured.

Root knot, caused by Heterodera radiculicola (Greef.) Muller, is one of the important bean troubles in California.

Root rot, caused by Ozonium omnivorum Shear, was severe on lima beans in Texas during 1918. The speckled lima bean was especially susceptible.

Fusarium sp. was reported from California. It was common in Orange County. In Huntington Beach district it was very severe.

Mosaic was reported from Pennsylvania and Texas.

Root rot, caused by Rhizoctonia sp., was present in Pennsylvania. It was somewhat general, producing severe loss on the bush limas which are much more susceptible than wax or string beans.

Leaf spot, caused by Cercospora canescens Ell. & Mart., was reported from Porto Rico where it was common.

Gray leaf spot, caused by Isariopsis griseola Sacc., was reported from Porto Rico.

MANGEL

Leaf spot caused by Cercospora beticola was reported from Minnesota. Generally distributed but producing a trace of injury.

Leaf wart, cause unknown, was reported from Washington.

OKRA

Wilt caused by Verticillium sp. was common in New Jersey wherever okra was grown. It probably produced about a 2-3% reduction in the yield.

Root rot caused by Ozonium omnivorum Shear was common in Texas. The estimated loss for the state was about 30%.

Root knot caused by Heterodera radiculicola (Greef.) Muller was reported from Georgia. The trouble was general, prohibiting growth in some sections, nevertheless the estimated loss for the state was small.

Leaf spot caused by Cercospora hibisci T. & Earle was reported from Porto Rico by J. A. Stevenson, where it was common and destructive.

Blossom blight caused by Choanephora cucurbitarum (B. & Br.) Thaxter was reported from Porto Rico.

Rhizoctonia injury was found in the Mobile section, Alabama, where it was common in one field.

Leaf spot possibly caused by Alternaria was found on okra at Vero, Florida.

PARSLEY

Drop caused by Sclerotinia libertiana Fekl. was reported as causing 2% reduction in yield at the Virginia Truck Experiment Station.

PARSNIP

Diseases caused little loss to the parsnip crop during 1918 judging from the very small amount of trouble reported.

Soft rot caused by Pacillus carotovorus Jones was general and moderately severe in Massachusetts, causing about a 2% loss. In Minnesota but a trace of it was found.

Early blight caused by Cercospora spii Fr. occurred locally in Chittenden County, Vermont, and was responsible for about 50% injury to the local crop.

A trouble which was very similar to mosaic appeared in a garden August 12 at Ithaca, New York.

PEA

Blight caused by Mycosphaerella pinodes Berk. & Blox.,
= Ascochyta pisi Lib.

Ascochyta pisi was reported present in Maine, Massachusetts, New York, New Jersey, Pennsylvania, Maryland, South Carolina, Mississippi, Louisiana, Arkansas, Ohio, Wisconsin, Montana (found for the first time), Washington and California. In general little loss was incurred. In New York the disease was common in all canning sections but as the spotting appeared late there was slight injury. There was, however, a 2% loss in Pennsylvania. In Wisconsin the variety Admiral was most susceptible. In that state growers are using rotation and clear seed with good results.

The following dates show when the disease was first noted in various states in 1918.

April.....	Louisiana	July 30.....	Pennsylvania
June 26.....	New York	July.....	Montana
June.....	Wisconsin		

Bacterial blight caused by Bacterium pisi Sackett.

Bacterial blight was found in Wisconsin, Montana and Colorado. It was about as usual in Wisconsin and Colorado but more prevalent and severe in Montana. Bacterial blight (undetermined, and which may be caused by Bacterium pisi) was general on the early crop of peas in Wisconsin and produced some loss. Dry weather at the time of the late crop served to lessen the injury.

Bacterial blight is the most important disease of peas in Montana being found everywhere the crop is grown. In 1918 there was more than the average amount. The average loss for the state is estimated at 2%. A few fields were completely devastated and a high percentage of injury around Bozeman is reported. In general the coarse strawed varieties were not so extensively damaged as were the early "short strawed" peas. The Alaska variety was most susceptible.

Septoria blight caused by Septoria pisi West.

In 1918 Septoria blight was reported from Pennsylvania, Maryland, Wisconsin (less than 1917), Ohio, Montana and Colorado. New York reported that none had been observed during the year. It was relatively unimportant wherever it occurred except in Montana where heretofore it had been of little or no consequence but during the past year had become well established and was observed doing damage in the various pea growing districts. As high as 20% loss was estimated in some of the principal pea regions. Leaves, stems and roots were affected. The lower stem and root lesions caused the most damage. According to H. M. Jennison of Montana the organism appeared to be introduced with the seed as instances were noted where peas planted on virgin soil were affected.

Mildew caused by Erysiphe polygoni D. C.

Mildew was found in Vermont, New York, New Jersey, Maryland, Georgia, Florida, Louisiana, Arkansas, Ohio, Montana, Washington and California. It was severe locally in Vermont (25% injury), New York and Georgia, and economically unimportant although quite common in Florida, California, Montana and Washington.

Root rots caused by Fusarium sp.

In 1918 Fusarium root rots were general in Massachusetts (moderately severe), New York (severe), Maryland (very severe), and Wisconsin and also reported from Connecticut (first report for state), Louisiana and Ohio. Its prevalence was about equal to that in 1917.

In fifteen counties in New York state a root rot was found which was thought to be caused by some Fusarium. About 3% injury to the entire crop was estimated in New York. No varietal resistance was noted.

R. E. Vaughan of Wisconsin suggests that rotation be practiced and that growers avoid planting in infested soil.

M. T. Cook of New Jersey believes that the loss due to this disease is of considerable importance but that they have had no way as yet of making a satisfactory estimate. The trouble was found in the spring and early summer, especially in light soils.

C. E. Temple reported the examination of three fields in Maryland which had approximately 100% of the plants diseased. These fields had been in peas for several successive years, while fields planted for the first time had little or no root rot, the average infection ran between 15 and 30%.

In Massachusetts many small growers lost their crop because of the failure of the peas to mature.

Other Diseases and Injuries 1918

Root knot caused by Heterodera radicum (grief.) Muller was one of the most common troubles of the crop in Florida.

Leaf spot caused by Cercospora pisi var. sativae Stev. Common in Porto Rico but unimportant. Phytophthora sp. - Frequent infection in seed pea district of Monterey Co., California.

Root rot caused by Thielavia basicola (B. & Br.) Zopf. was prevalent, but not usually serious except in gardens; in Pennsylvania. In the western part of Arkansas root rot was found most severe where sod had been broken to plant gardens which might be an indication of association of the fungus with white clover.

Frost injury - In Spokane, Co., Washington.

White pod spot (Non-parasitic) - Spokane and Whitman County, Washington.

Damping off - In New York two-thirds of the peas in one field were killed.

Stem rot - Corticium vagum var. solani Burt. A common trouble on the pea in Florida. A trace in Minnesota. Severe in Washington along Columbia River and Puget Sound region. Severe locally in Pennsylvania.

Downy mildew caused by Peronospora viciae Berk. Reported from New York, Maryland and Kansas.

PEANUT

Leaf spot caused by Cercospora personata (B. & C.) E. was found in Tennessee, South Carolina, Georgia, Porto Rico, Mississippi, Louisiana, Alabama, Oklahoma and Arkansas. It was general in occurrence in all the states where present. In Tennessee it is estimated that as high as 75% of the crop was more or less injured while the loss is estimated as 50,000 bushels. In South Carolina the crop injury was about 20%. In Georgia the injury was somewhere around 50%, resulting in an estimated loss of 5%. Entire defoliation, badly diseased stalks, and severely infected pods were found in the fields in Georgia. The forage value of the vines was reduced as well as the produc-

tion of pods. It was first noticed September 1 in Tennessee and September 4 in Georgia. All varieties appeared susceptible. In Tennessee the Virginia White seemed to be most susceptible. No treatment was recommended.

Wilt caused by Sclerotium rolfsii Sacc. was reported from Tennessee, Georgia, Alabama and Texas. Its occurrence was mostly local except in Georgia and Alabama. It was quite prevalent. The damage was generally rather slight.

Stem rot suspected as being caused by a species of Fusarium was reported in Virginia and in Tennessee heavy losses resulted from a soil disease which cultures showed to be associated with Fusarium. The symptoms, however, were like those of Rhizoctonia.

Stem rot caused by Botrytis sp. was reported from the District of Columbia. All of the plants in a garden patch were affected and produced practically no yield on account of the disease. It was first observed September 15.

Fruit rot (cause undetermined) was reported by Peltier from Alabama, causing 5% damage. It was found in a field which was not harvested promptly at maturity.

Rust caused by Uredo arachidis Lagerh., was common in Porto Rico during 1918.

Yellows (cause undetermined) was reported from Alabama. It was also found in that state in 1917 when it was common locally.

Drought seriously injured peanuts in Texas and Arkansas.

SHALLOT

Pink root caused by Fusarium mallii was reported from Texas.

SOY BEAN

Root knot caused by Heterodera radiculicola (Greef.) Muller was very common in South Carolina. There was a crop injury of about 25%.

Bacterial leaf spot was reported from Pennsylvania and Indiana.

Root rot caused by Sclerotium rolfsii Sacc. was very common in Alabama. The crop injury ranged from 5 to 10%. The disease was rather severe in old fields.

Wilt caused by Fusarium sp. was reported from Tennessee, South Carolina, and Alabama. In Tennessee the disease is local and increasing in prevalence, the crop injury about 5%. In South Carolina it is frequently found. In Alabama it is common and becoming more severe each year. The weather conditions during 1918 appeared to be favorable for the growth of the organism.

Drought injury was reported from Washington.

SPINACH

Blight (cause undetermined)

Spinach blight was reported only from New Jersey during 1918, although it is practically certain that it occurred in other spinach growing centers in a number of states. It has been reported to the Survey prior to 1918 from New York, New Jersey, Virginia and Ohio. The losses were heavy last year

in New Jersey. According to McClintock and Smith, the losses in eastern Virginia annually amount to at least 20% of the crop, or about \$200,000 to \$400,000. Abundant quantities of aphids were associated with blight in New Jersey.

A physiological disease not positively identified as blight but which caused a crinkling of the leaves was reported by G. P. Clinton as being new in Connecticut. It was found in three fields in New Haven County on August 26. More was found on Sanford White than on Sulzer's Easy Bleaching.

Downy mildew caused by Peronospora effusa Rabenh.

Downy mildew was reported from Louisiana and Texas. In Texas the disease was general but, due to the hastening of the harvest, did not cause much loss. If the spinach had been permitted to remain the full length of time in the field much damage would have resulted.

Anthracoze caused by Colletotrichum spinaciae E. & H.

This disease occurred occasionally in Connecticut during 1918 with a slight injury to the crop. In Virginia it was noticed in 1915-1917. In 1915, although not common, it resulted in about a 10% crop injury; in 1916 it was common but caused little loss; in 1917 it was common and was said to have brought about an approximate loss of 5%.

Soft rot probably caused by Bacillus carotovorus and related sp.

Table XIV. Losses from bacterial soft rot as shown by inspection of cars at destination by inspectors of the Bureau of Markets.

Origin of shipment	: No. of cars with decay	: Percentage of decay	: Remarks as to seriousness of decay
California	: 1	: 75%	: 75% totally decayed stock.
Missouri	: 2	: 1 car 100%	: Spinach so badly decayed as to be worthless.
		: ---	: Bad decay in centers of baskets.
Texas	: 13	: 2 cars 100%	: Contents worthless,
		: 1 " 100%	: All spinach showing some decay.
		: 10 " 25-75%	: Very heavy decay at top of each car, much stock worthless, salable stock only in 2 lower layers of cars.
Origin unknown	: 1	: 60-95%	: Most of stock decayed and worthless.

Other diseases.

Leaf spot, caused by Macrosporium cheiranthi (Lib.) Fr., has so far been reported only from Ohio where it was found in 1915, 1917 and 1918.

Leaf spot, caused by Cercospora sp., appeared in a moderate amount in Massachusetts (first report). It was present in Texas in 1916.

A leaf spot of uncertain cause, but which showed *Vermicularia* as the only fungus present, was reported from New York, June 26.

Scab caused by *Cladosporium macrocarpum* Preuss., has not been reported to the Plant Disease Survey since 1909, at which time it was serious in the southern part of Delaware.

Rhizoctonia (*Corticium vagum* var. *solani* Burt.) was reported from Washington as occurring in Clarke County.

TEPARY BEAN

Rust caused by *Uromyces appendiculatus* (Pers.) Lev. was reported from Texas and California. In Texas the loss was about 10%.

Root rot caused by *Ozonium omnivorum* Shear was reported from Texas where it occurred especially on the Tepary bean which was the most susceptible.

Fusarium sp. was found in California. It formed lesions on the lower stems of plants.

VELVET BEAN

Bacterial leaf spot was reported from South Carolina.

Leaf spot, apparently caused by *Septoria* sp. was reported from Georgia where it occurred locally in Wake County, destroying 25% of the leaf surface, resulting in partial defoliation. The loss was negligible.

Leaf spot caused by *Cercospora mucunae* Syd. was reported from Porto Rico.

Root rot caused by *Sclerotium rolfsii* Sacc. was reported from Alabama.

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THE PLANT DISEASE BULLETIN

Issued By

The Plant Disease Survey

SUPPLEMENT 4

Summary of Plant Diseases in the United States
in 1918 -- Diseases of Cereal and Forage Crops

June 20, 1919

BUREAU OF PLANT INDUSTRY

UNITED STATES DEPARTMENT OF AGRICULTURE

SUMMARY OF PLANT DISEASES IN THE UNITED STATES IN 1918.

IV. DISEASES OF CEREAL AND FORAGE CROPS.

Prepared by
R. J. Haskell.

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DISEASES OF CEREAL CROPS.

WHEAT

Bunt caused by Tilletia laevis Kuhn and T. tritici (Bjerk.) Wint.

Bunt occurred rather widely over the United States last year as usual. The extensive survey for cereal diseases conducted by the Office of Cereal Investigations of the Department of Agriculture has helped greatly in determining the geographical distribution of and losses occasioned by bunt and cereal diseases in general. The results of the cereal survey have been made available for this report. The following table shows the average percentage of bunt for each state where surveys were made and the total number of fields inspected in the state.

Table XV. Average percentages of bunt found in the various states by field men of the Office of Cereal Investigations.

State	Production:	No. of	Average	State	Production:	No. of	Average
	1918	fields	percent		1918	fields	percent
	Bushels	inspect-	bunt		Bushels	inspect-	bunt
	(000	ed			(000	ed	
	omitted)				omitted)		
Me.	506	67	.5	Mo.	53,154	817	1.6
N.H.	--	83	t	N.D.	101,010	203	1.5
Vt.	396	161	t	S.D.	71,305	22	2.1
Mass.	--	12	t	Nebr.	43,141	237	6.6
R.I.	--	1	0	Kans.	102,008	197	1.2
Conn.	--	76	.1	Ky.	12,129	211	.2
N.Y.	7,840	237	t	Tenn.	7,500	244	2.
N.J.	1,700	73	.7	Ala.	1,330	225	1.9
Pa.	24,718	364	.2	Miss.	495	169	1.3
Del.	1,729	--	-	La.	--	17	t
Md.	11,346	95	.2	Texas	8,920	190	t
Va.	15,600	323	2.7	Okla.	32,891	167	.4
W. Va.	4,942	144	.7	Ark.	3,048	157	2.2
N.C.	7,105	249	.7	Mont.	25,434	208	2.4
S.C.	2,255	38	.5	Uyo.	6,600	41	1.
Ge.	3,631	133	1.3	Colo.	13,335	77	2.4
Fla.	--	--	-	N. Mex.	3,334	--	-
Ohio	43,547	348	.9	Ariz.	988	--	-
Ind.	49,427	158	2.7	Utah	6,464	--	-
Ill.	60,991	51	1.8	Nev.	1,070	--	-
Mich.	10,716	228	3.6	Idaho	18,043	--	-
Wis.	9,837	251	7	Wash.	26,429	806	2.5
Minn.	79,710	789	3.5	Ore.	15,228	--	-
Iowa	19,650	435	1.1	Calif.	7,590	341	7.5

In the crop loss estimates of the Plant Disease Survey for 1918 (Plant Disease Bulletin Supplement 6, 1919.) these figures have been taken as a basis for estimates but they have been altered somewhat in ways that are believed to represent more actually the true conditions. The estimate of the Plant Disease Survey for loss from bunt in the United States in 1918 is 2% or 19,063,000 bushels, 2,931,000 bushels less than in the year 1917. This much reduction in the amount of bunt from one year to the next could easily be brought about by the seed treatment campaign conducted in 1917-1918.

As will be seen from the above table the greatest average percentages of bunt occurred in California, Nebraska, Michigan, Minnesota, etc. in order of importance. The greatest loss of wheat, however, occurred in Minnesota, Nebraska, North Dakota and South Dakota where the production is large and bunt common.

In the spring wheat states such as the Dakotas and Minnesota, the disease was said to be more abundant on spring wheat than on winter wheat. It was reported as being more common than usual in Michigan and Minnesota but less than normal in Oregon.

At the meeting of cereal pathologists at La Fayette, Indiana, June 19-21, 1918, considerable interest was shown in the geographical distribution of the two species of *Tilletia* causing bunt of wheat. A. A. Potter was appointed leader of the project of obtaining more definite information on the matter, the work to be undertaken in cooperation with the Plant Disease Survey and the War Emergency Board of American Pathologists. Letters and blanks outlining the project were distributed widely to plant pathologists and botanists both in the United States and Canada through the organization of the Plant Disease Survey.

Replies were received from 21 states and provinces. The summary of results is given in Table XVI.

Table XVI. Summary of Determinations of *Tilletia tritici* and *T. laevis* on wheat as shown by questionnaires of plant pathologists, 1918. All determinations were based on microscopic examination.

State where collected	State where reported	<i>Tilletia tritici</i>				<i>Tilletia laevis</i>			
		Locality where collected	Date of collection	Collector	Identified by	Locality where collected	Date of collection	Collector	Identified by
Mass.	Mass.	----	----	----	----	Amherst	7-18-18	Anderson	Wheeler & Pierson.
N. Y.	N. Y.	----	----	----	----	Ithaca	6-17-15	Chupp	Smiley.
						Ithaca	6-19-15	Barrus	Smiley.
						Ithaca	7-26-15	Barrus	Smiley.
						Ithaca	10-21-15	Barrus	Smiley.
						W. Junius	7-9-16	Whetzel & Jackson	Smiley.
						Ithaca		Class	Smiley.
Pa.	Pa.	----	----	----	----	Lycoming Co.	7-17-14	Bell	Voris.
Va.	Va.	----	----	----	----	Blacksburg	6-20-02	Wood	Fromme.
						Blacksburg	6-25-99	Scott	Fromme.
						Blacksburg	6-23-91	Alwood	Fromme.
Ky. ¹	Vt.	----	----	----	----	Lexington	6-24-90	Garman	Lutman.
	Mass.					Lexington	6-24-90	Garman	Wheeler & Pierson.
						Lexington	6-24-90	Garman	Smiley.
	N. Y.					Lexington	6-24-90	Garman	Macpherson.
	N. J.					Lexington	6-24-90	Garman	Mains.
	Ind.					Lexington	6-24-90	Garman	MacInnes.
	Minn.					Lexington	6-24-90	Garman	Rose.
	Oreg.					Lexington	6-24-90	Garman	Faull & Cook.
	Ont.					Lexington	6-24-90	Garman	Smiley.
N. C.	N. Y.	----	----	----	----	Fairview	7-2-07	Stevens	

Tilletia tritici

Tilletia laevis

Minn.	:		:		:		:	:MacInnes	:	St. Paul	:	1909	:	Freeman	:	MacInnes.
Minn.	:	Koochiching Co.	:	8-2-18	:	Gillis	:	MacInnes	:	St. Paul	:	1907	:	----	:	MacInnes.
Minn.	:	Beltrami Co.	:	7-31-18	:	Gillis	:	MacInnes	:	Crookston	:	1913	:	-----	:	MacInnes.
Minn.	:	Beltrami Co.	:	7-30-18	:	Gillis	:	MacInnes	:	Red River	:	1908	:	Smith	:	MacInnes.
Minn.	:	Beltrami Co.	:	7-29-18	:	Gillis	:	MacInnes	:	Two Harbors	:	1916	:	Stakman	:	MacInnes.
Minn.	:	Todd Co.	:	7-27-18	:	Gillis	:	MacInnes	:	Hastings	:	1915	:	Stakman	:	MacInnes.
Minn.	:	Red Lake Falls	:	7-29-18	:	Plagge	:	MacInnes	:	Audubon	:	1915	:	Stakman	:	MacInnes.
Minn.	:	Mahnomen	:	7-27-18	:	Bakke	:	MacInnes	:	Farmington	:	--	:	Borthwick	:	MacInnes.
Minn.	:	Wadena	:	7-25-18	:	Tucker	:	MacInnes	:	Pine City	:	1918	:	Fradenburg	:	Thurston.
Minn.	:	Park Rapids	:	7-24-18	:	Tucker	:	MacInnes	:	29 Collections	:	1918	:	Cereal	:	MacInnes.
Iowa	:		:		:	Newhall	:	MacInnes	:		:		:	Scouts	:	
Iowa	:	Grand Rapids	:	8-6-18	:		:	MacInnes	:	Decorah	:	8 - 1884	:	Holway	:	Wheeler & Pierson.
N. J.	:		:		:		:		:	Decorah	:	8 - 1884	:	Holway	:	Macpherson.
Ind.	:		:		:		:		:	Decorah	:	8-1-84	:	-----	:	Mains.
	:		:		:		:		:	Central	:	'79-'80	:	Roberts	:	Mains.
Minn.	:		:		:		:		:	Decorah	:	8 - 1884	:	Holway	:	Macpherson.
Neb.	:		:		:		:		:	Decorah	:	8 - 1884	:	Holway	:	Thurston.
Iowa	:		:		:		:		:	Story Co.	:	---	:	Stewart	:	Durrell.
	:		:		:		:		:	Monona Co.	:	1918	:	Martin	:	Durrell.
	:		:		:		:		:	Monona Co.	:	1918	:	Martin	:	Durrell.
	:		:		:		:		:	----	:	1904	:	Baker	:	Durrell.
No.	:	Single specimen	:	---	:	----	:		:	46 counties	:	1918	:	Cereal men	:	Johann.
Iowa	:		:		:		:		:	Mayville	:	1918	:	Bakke	:	Durrell.
N. Dak.:Conn.	:	Kulm	:	9 - 1909	:	Brenckle	:	Clinton	:	Kulm	:	9 - 1908	:	Brenckle	:	Clinton.
Pa. 4	:	Kulm	:	10-2-10	:	Brenckle	:	Kirk	:	Kulm	:	10-20-10	:	Brenckle	:	Voris.
Ind. 4	:	Kulm	:	10-2-10	:	Brenckle	:	Mains	:	Kulm+	:	10-20-10	:	Brenckle	:	Mains.
Oreg. 4:	:	Kulm	:	10-2-10	:	Brenckle	:	Rose	:	Kulm+	:	10-20-10	:	----	:	Rose.
Minn.	:		:		:		:		:	Valley City	:	8-24-18	:	Piemeisel	:	MacInnes.
	:		:		:		:		:	Dickinson*	:	1915	:	Piemeisel	:	MacInnes.
S. Dak.Vt. 5	:	Pingree	:	1912	:	Campbell	:	Lutman	:	Eureka	:	10-1895	:	Griffiths	:	Wheeler & Pierson.
Mass.	:	Newell 5	:	7-11-12	:	Carr	:	Wheelar &	:	Scatterwood	:	7-- 1896	:	Griffiths	:	W. & P.
	:		:		:		:	Pierson	:	Brookings	:	1905	:	Wheeler	:	Clinton.
Conn.	:		:		:		:		:	Flanders	:	8 - 1892	:	Griffiths	:	Clinton.
Conn.	:		:		:		:		:	Scatterwood	:	10-1895	:	Griffiths	:	Macpherson.
N. J.	:		:		:		:		:	Newell*	:	7-11-12	:	Carr	:	Mains.
Inu. 5	:	Newell	:	7-11-12	:	Carr	:	Mains	:		:		:		:	

		Tilletia tritici		Tilletia laevis	
Idaho	Idaho	Boundary Co. (1)	: Zundel	: Bingham Co. (1)	: 1918
		Levis Co. (3)	: Zundel	: Gooding Co. (2)	: 1918
		Pover Co. (5)	: Zundel	: Fremont Co. (1)	: 1918
		Gooding Co. (3)	: Zundel	: Minidoka Co. (1)	: 1918
		Minidoka Co. (2)	: Zundel	: Bonneville Co. (1)	: 1918
		Caryon Co. (2)	: Zundel	: Canyon Co. (1)	: 1918
		Winchester	: Rose	: Jefferson Co. (1)	: 1918
		Ilo	: Rose	:	:
		Pocatello	: Rose	:	:
Oreg.	Oreg.	Whitman Co. (70)	: Zundel	: Pocatello	: 1918
Wash.	Wash.	Asotin Co. (25)	: Zundel	: Thurston Co. (2)	: 1918
		Walla Walla (7)	: Zundel	:	:
		Stevens Co. (6)	: Zundel	:	:
Wash.	Wash.	Spokane Co. (3)	: Zundel	:	:
		Yakima Co. (4)	: Zundel	:	:
		Kittitas Co. (1)	: Zundel	:	:
		Thurston Co. (4)	: Zundel	:	:
		Island Co. (5)	: Zundel	:	:
		Okanogan Co. (3)	: Zundel	:	:
		Douglas Co. (1)	: Zundel	:	:
		Klickitat Co. (7)	: Zundel	:	:
		Chelan Co. (3)	: Zundel	:	:
N. J.	N. J.		:	: Heald	: 1916
Conn.	Conn.	Rutledge	: Clinton	: Macpherson	: Macpherson
			: & Cotton	:	:
N. Y.	N. Y.		: Smiley	:	:
			: Macpherson	:	:
Pa.	Pa.	Near Garfield	: Voris	:	:
Minn.	Minn.	Pullman	: MacInnes	:	:
			: MacInnes	:	:
Oreg.	Oreg.	Morroe	: Rose	: 27 towns	: Cereal
		Corvallis	: Rose	:	: Disease
			: Young	:	: Survey
		Amity	: Rose	:	:
		Salem	: Rose	:	:
		Newberg	: Rose	:	:
		Layton	: Rose	:	:
		Sheridan	: Rose	:	:

State	Locality	Year	Collector	Notes
Oreg.	Monmouth	1918	Woodham & Young	Rose
	Independence	1918	W. & Y.	Rose
	McMinnville	1918	W. & Y.	Rose
	Canby	1918	Bell	Rose
	Silverton	1918	Bell	Rose
	Scio	1918	Bell	Rose
	Gresham	1918	W. & Y.	Rose
	Oregon City	1918	W. & Y.	Rose
	Estacada	1918	W. & Y.	Rose
	Tallman	1918	W. & Y.	Rose
	Forest Grove	1918	W. & Y.	Rose
	Farmington	1918	W. & Y.	Rose
	Wilksboro	1918	W. & Y.	Rose
	Gaston	1918	W. & Y.	Rose
	Hillsboro	1918	W. & Y.	Rose
	Medford	1918	Woolman	Rose
	Klamath Falls	1918	Woolman	Rose
	Condon	1918	Bell & Kerns	Rose
	Clem	1918	B. & K.	Rose
	Hernes	1918	B. & K.	Rose
	Lagrande	1918	B. & K.	Rose
	Hot Lake	1918	B. & K.	Rose
	Baker	1918	B. & K.	Rose
	Enterprise	1918	B. & K.	Rose
	Union	1918	B. & K.	Rose
	North Powder	1918	B. & K.	Rose
	Intler	1918	B. & K.	Rose
	Summerville	1918	B. & K.	Rose
Ind.	Ashland	9-1910	Jackson	Mains
	Plush	10-7-12	Chahtrand	Mains
Oreg.	Plush	10-7-12	Chahtrand	Rose
	Ashland	9-1-10	Jackson	Rose
Man.	Indian Head	8-1917	Cowan	Fraser
	Indian Head	8-29-18	Fraser	Fraser
	Saskatoon	9-2-18	Fraser	Fraser
	Saskatoon (Many)	1916-17	Thompson	Thompson
Sask.	Saskatoon	1918	Bracken	Thompson

7. Ell. & Ev. N. Am. Fungi, 3236
8. Kreiger, Fungi Sax. 201.

9. Linhart Fungi Hung. 10.
10. Briosi & Cavara, 155.

- Notes: a. Practically all bunt collected in western Canada is T. tritici. The collections of T. laevis consisted of only a few heads except Winnipeg collection of 1917.
- b. In several collections of *Tilletia* made by J. H. Faull in Alberta and Saskatchewan in 1906 both T. laevis and T. tritici were found.
- c. Numbers in parenthesis after places of collection indicate number of collections.
- d. The following symbols have been used in the preceding tabulation:

* = Mixed with T. tritici
+ = Distributed as T. tritici
° = Distributed as T. laevis (foetens).
x = Mixed with T. laevis.

Table XVII. Numbers of individual collections of Tilletia tritici and Tilletia laevis on wheat as shown in reports of collaborators in 1918. This is essentially a summary of table XVI.

State : Number of Collections			State : Number of Collections		
: T. laevis		: T. tritici	: T. laevis		: T. tritici
Me.	0	0	Ark.	-	-
N. H.	-	-	Ohio.	-	-
Vt.	0	0	Ind.	7	1
Mass.	1	0	Ill.	3	0
R. I.	-	-	Mich.	6	6
Conn.	-	-	Wisc.	21	3
N. Y.	6	0	Minn.	39	13
N. J.	-	-	Iowa	5	0
Pa.	1	0	Mo.	46	1
Del.	-	-	N. Dak.	4	1
Md.	-	-	S. Dak.	6	1
Va.	3	0	Neb.	1	0
W. Va.	-	-	Kans.	5	1
Ky.	1	0	Mont.	1	0
Tenn.	-	-	Wyo.	1	0
N. C.	1	0	Colo.	-	-
S. C.	-	-	N. Mex.	5	1
Ga.	-	-	Ariz.	-	-
Fla.	-	-	Utah	7	2
Ala.	-	-	Nev.	-	-
Miss.	-	-	Idaho	9	19
La.	-	-	Wash.	3	133
Texas	1	0	Oreg.	27	39
Okla.	2	1	Calif.	-	-
:	:	:	:	:	:

Loose smut caused by Ustilago tritici (Pers.) Jens.

Loose smut occurred widely over the country. In the east it was much more frequently found than bunt and in a number of states caused a greater loss than that disease. According to the results of the cereal survey and reports of collaborators, loose smut seems to have been most abundant in an area comprising the coastal plain region of South Carolina, North Carolina, and Virginia, and also Maryland. It was also severe, although less so, in the states of New Jersey, Pennsylvania, West Virginia, Ohio, Indiana, Illinois, Missouri and parts of Arkansas and Tennessee. It is significant to note that in some of the more northern states such as Michigan, Wisconsin and Minnesota the disease was said to be more abundant in the southern portions than in the northern. In Michigan it is mentioned that there seemed to be a relation between the prevalence of loose smut and the amount of winter-killing, the disease being more prevalent in the areas or fields of least winter-killing.

The losses from loose smut in 1918 have been estimated for the United States by the Plant Disease Survey as follows: (See also Plant Disease Bulletin Supplement VI, 1919.).

Table XVIII. Estimated percentages of loose smut by states, 1918.

State	Percent	State	Percent	State	Percent
Me.	.7	Fla.	-	Miss.	1.4
N. H.	.7	Ohio	1.9	La.	t
Vt.	.8	Ind.	2.4	Texas	.7
Mass.	.4	Ill.	1.5	Okla.	.6
R. I.	.5	Mich.	.6	Ark.	5.
Conn.	1.	Wis.	t	Mont.	2.
N. Y.	.5	Minn.	.5	Wyo.	t
N. J.	1.4	Iowa	.4	Colo.	.2
Pa.	1.7	Mo.	1.1	N. Mex.	t
Del.	-	N. D.	.5	Ariz.	t
Md.	4.	S. D.	1.5	Utah	-
Va.	3.	Nebr.	.5	Nev.	t
W. Va.	2.	Kans.	.4	Idaho	-
N. C.	2.7	Ky.	.7	Wash.	t
S. C.	1.8	Tenn.	1.	Ore.	t
Ga.	4.	Ala.	1.	Calif.	t

Estimated bushels loss, United States, 9,368,000.

The above figures show that loose smut is of considerable economic importance at least in certain parts of the country. It also appears from other information at hand that very little is being done by farmers to control the disease.

Stem rust caused by Puccinia graminis Pers.

Stem rust occurred widely over the grain producing area, but only in a few local instances did it cause any serious loss. The weather con-

ditions were fairly favorable for rust in parts of the spring wheat region, but the early harvest coupled with the late appearance of the rust resulted for the most part in the wheat escaping the disease. The following figures give the average percentages of affected sheath and stem area by states according to the observation of scouts of the Cereal Office.

Table XII. Average percentages of stem rust by states as determined by field men of U. S. Dept. of Agriculture 1918. Figures represent percentages of affected area according to the standard scale for estimating rusts.

State	No. fields:	%:	State	No. fields:	%:	State	No. fields:	%:
	examined	rust:		examined	rust:		examined	rust
Me.	67	t	Ga.	133	1.3	Ky.	211	7.5
N. H.	83	t	Ohio	348	8.6	Tenn.	244	6.6
Vt.	161	1	Ind.	158	2.3	Ala.	225	t
Mass.	12	t	Ill.	51	2.9	Miss.	169	2.5
Conn.	76	t	Mich.	228	15.9	La.	17	0
N. Y.	237	.7	Wis.	251	23.8	Texas	190	.9
N. J.	73	.5	Minn.	789	5.	Okla.	167	1.9
Pa.	364	.8	Iowa	435	3.3	Ark.	157	-
Md.	95	t	Mo.	817	1.	Mont.	208	0
Va.	323	2.	N. D.	203	-	Wyo.	41	t
W. Va.	144	1.8	S. D.	22	39.6	Colo.	77	-
N. C.	249	.7	Nebr.	237	6.2	Wash.	806	t
S. C.	38	4.6	Kans.	197	2.4	Calif.	341	1

It will be seen that the percentages of rust were rather high in Michigan, Wisconsin and South Dakota. It was also epidemic in parts of Ohio, causing some loss in certain southwestern counties, but the average for the state is not high. For the country as a whole, 1918 may be considered an off year for stem rust.

Barberry eradication progressed very satisfactorily throughout the season. The work was pushed enthusiastically in a large number of the northern cereal states with the result that the majority of barberry bushes were eliminated in most states. The campaign threw much light on the wide range of the common barberry and the relation that it bears to the cereal rust. Hundreds of instances were observed showing that the presence of infected barberry bushes were responsible for outbreaks of rust on grains.

Leaf rust caused by *Puccinia triticina* Erik.

During the season of 1918 the Plant Disease Survey gathered considerable information on the occurrence of leaf rusts. Six men obtained field data in most of the principal eastern wheat states, starting in the South and working northward with the season. In addition to these results, the field men from the Office of Cereal Investigations engaged in seed treatment and survey work secured extensive estimates of percentages of leaf rust in many states.

Last year, as usual, leaf rust was very common in wheat fields, particularly in the southeastern quarter of the United States. It was found by the survey men in practically every locality visited except in some of the

more northern counties of the country. West of the Mississippi and in the northern tiers of states the disease was not nearly so abundant and did not seem to be of any particular consequence.

The economic importance of this rust has been questioned by many pathologists. It is maintained that the affection of the leaves, coming on rather late in the season, as it usually does, does not materially reduce the size or number of kernels. After the kernels are well formed it is said that the leaves are not necessary for full development of the grain so long as the culms remain green. In 1917, collaborators were asked in a questionnaire if they considered the disease of economic importance and replies from Pennsylvania, Maryland, North Carolina, South Carolina, Tennessee and Indiana were in the affirmative. Collaborators in most of the other states indicated that usually it was not of importance. In Oregon it was said to be of importance on certain varieties only. The results secured by the survey men in 1918 indicate that there was considerable crop injury in many of the eastern states. The amount of reduction in yield could not be determined, but it was thought to be decidedly appreciable. The following table shows the average percentages of rust found in the various states.

Table XX. Average percentages leaf rust (according to scale for estimating cereal rusts) as found by field men, 1918.

State	Results of Plant Disease Survey men.				Results of Cereal Office Men	
	No. acres	% affected	% affected	Average %	No fields	Average %
	inspected	plants	leaf area	affected	inspected	affected
	:	:	on affected:	leaf area:	:	leaf area
	:	plants	:	:	:	:
Me.	-	-	-	-	67	15.
N. H.	-	-	-	-	83	12.
Vt.	-	-	-	-	161	19.
Mass.	-	-	-	-	12	7.6
R. I.	-	-	-	-	1	65.
Conn.	-	-	-	-	76	9.2
N. Y.	409.5	74	27	20	237	17.
N. J.	-	-	-	-	73	43.
Pa.	1407.	85	78	66	364	48.7
Md.	259.	80	36	29	95	28.9
Va.	701.	100	39	37	323	37.9
W. Va.	-	-	-	-	144	47.9
N. C.	343.	94	31	29	249	29.7
S. C.	296.	79	24	19	38	35.8
Ga.	356.	96	33	32	133	26.3
Ohio	1037.5	96	54	52	348	28.8
Ind.	218.	96	36	35	158	-
Ill.	350	83	12	10	51	6.5
Mich.	814.	87	32	28	228	20.6
Wis.	1163.	87	28	22	251	39.7
Minn.	-	-	-	-	789	7.
Iowa	2507	85	16	14	435	13.
Mo.	3491	100	18	18	817	8.3

State :	Results of Plant Disease Survey men.				Results Cereal Office Men.	
	No. acres	% affected	% affected	Average %	No. fields	Average %
	inspected	plants	leaf area	affected	inspected	affected
	:	:	on affected	leaf area:	:	leaf area
			plants			
N. D.	-	-	-	-	203	-
S. D.	3182.	72	14	10	22	9.6
Nebr.	1668	73	37	27	237	5.
Kans.	2767.5	77	20	15	197	5.2
Ky.	1417.5	100	68	68	211	30.3
Tenn.	1142.	99	54	55	244	28.
Ala.	69	100	55	55	225	30.5
Miss.	-	-	-	-	169	25.9
La.	-	-	-	-	17	55.8
Texas	878.5	80	23	13	190	1.4
Okla.	1440.	79	35	23	167	6.6
Ark.	448.1	98	41	40	157	-
Mont.	-	-	-	-	208	t
Wyo.	-	-	-	-	41	t
Colo.	-	-	-	-	77	t
Wash.	-	-	-	-	806	t
Calif.	-	-	-	-	341	t

According to observations of the field men, the amount of damage depends largely on the time and severity of the early infections and on the weather during the earlier part of development of the wheat. If infection is heavy very early in the history of the plant and conditions are favorable for the rust, it can easily be seen that damage must result.

It was the common observation of the field men that leaf rust was more abundant on the most vigorous plants and less so on the poorer plants. It seemed to be worst in spots in fields where the growth was heavy and where the dew stayed on the plants longest. Less disease appeared to be present in the small and isolated fields and in fields where the stand was thin.

Temperature seemed to be an important factor in influencing the development of leaf rust. A rather high temperature seemed to favor it. In northern Michigan the moisture relation seemed favorable but it was cool and there was very little rust. It was also noticed by the field men that the abundance of the rust, the losses that it occasioned, and the frequency of teliospore formation decreased as they proceeded from the southern states to those in the north. This points to the temperature relation as being important. Again in Tennessee it was noticed that there was less rust on higher grounds. In the mountains of that state there was an average of about 5% affected leaf area while in the valleys 90% was the rule.

Teliospore formation was found to be abundant in such states as Alabama, Tennessee, Kentucky, Texas, Oklahoma, Kansas and Nebraska. It was fairly common in South Dakota and southern Michigan, but rare in northern Michigan.

Differences in varietal susceptibility were noted, but they were not very marked. Early maturing varieties such as Marquis and some others showed less rust in the western part of the area surveyed than did later ones. In South Dakota, however, Marquis planted later showed considerable rust. It was thought that when planted early it matured before the heavy infection

period came on. It was noted by a number of field men that it was worse on winter than on spring wheat. One man estimated 93% affected leaf area on winter wheat seen and 45% on spring wheat.

In a number of the southern states, it is evident that infection takes place in the fall and the rust lives over winter on the plants and is plentiful in the spring when weather conditions become right for spring infection. This is probably one reason why the disease is worst in the south.

Scab caused by Fusarium sp.

Scab was reported in 1918 from all wheat states east of the Missouri River and two reports were received from Montana for the first time. A glance through the survey records from 1903 to 1917 shows that the only reports from states west of the Missouri are from Oregon in 1917 and from Utah in 1916 and 1917. In both of these states the disease was rare, however. Since 1903, scab has been reported most frequently from states in the belt that extends from Pennsylvania and Delaware westward to Nebraska and the Dakotas.

It is noticeable that the area where scab occurs is more or less coincident with the belt where corn and wheat are both grown. In states such as Minnesota and Wisconsin, it is significant that scab occurred only in the southern portions where corn is grown. The fact that the scab and corn areas coincide adds further proof that wheat scab and corn root rot may be caused by the same organism.

In 1918, scab was most severe in parts of New Jersey, Pennsylvania, Maryland, Virginia, West Virginia, Kentucky, Tennessee, Ohio, Indiana, Illinois, and Missouri on winter wheat. It was severe on spring wheat in Iowa, southern Minnesota, and South Dakota.

It seems to be abundant annually in Tennessee and states bordering on the Ohio River, but last season it was unusually so. The highest percentage of loss occurred in Kentucky (3.2%), Tennessee (2.2%), Pennsylvania (3%), Ohio (2%), Virginia (1.5%), West Virginia (1.5%), and Iowa, while the greatest losses in bushels occurred in Ohio, Illinois, Indiana, and Kentucky.

The disease became prevalent in the spring wheat states in August, considerably later than in the winter wheat area. Dates of first appearance of scab were reported as follows:

May 16 - Georgia	June 1 - Illinois	June 29 - New York
May 20 - Tennessee	June 1 - Missouri	July - Connecticut
May 30 - Kentucky	June 8 - Ohio	July 10 - Wisconsin
June 1 - Virginia	June 13 - Pennsylvania	August - Minnesota

Marquis was reported as especially susceptible in Iowa, Minnesota, North Dakota and South Dakota. Durum was susceptible in Minnesota and North Dakota and Turkey Red in Iowa.

Stripe rust caused by Puccinia glumarum (Schm.) Er. & Hw.

Stripe rust of wheat was reported to the Survey only from Washington (Shohomish and Clarke Counties).

Nematode caused by Tylenchus tritici Bauer.

The geographical range of wheat nematode was more definitely determined during the year 1918. In 1917, it was reported from a number of points in Virginia, and one locality in California. In 1918, a description and specimens were put into the hands of collaborators in all states. Field men of the Department of Agriculture were asked to keep watch for the disease and in addition a special survey of Virginia was made by the Plant Disease Survey.

As a result of the survey and propaganda work, the nematode was found in 13 new counties in Virginia and also in three new states; namely, West Virginia (6 counties), Maryland (2 counties) and Georgia (1 county). The following is a list of counties where nematode was found on wheat in 1917 and 1918:

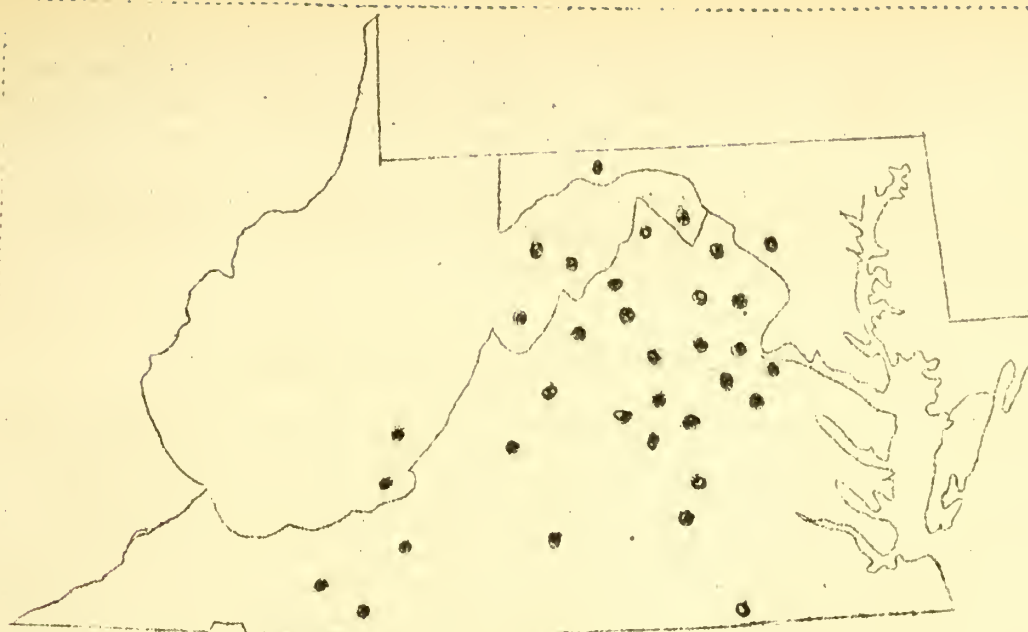
<u>Virginia</u>	Loudoun	Greenbriar
Albemarle	Louisa	Pendleton
Amelia	Montgomery	Grant
Augusta	Page	Hardy
Campbell	Prince William	Jefferson
Caroline	Rockbridge	
Clarke	Rockingham	<u>Maryland</u>
Culpeper	Shenandoah	Montgomery
Fauquier	Spotsylvania	Alleghany
Fluvanna	Stafford	
Frederick	Wythe	<u>Georgia</u>
Greensville		Jackson
King George	<u>West Virginia</u>	
	Monroe	

A report was received also from a Virginia miller of the disease occurring at Norwood, Stanley County, North Carolina in 1914. This report has not been substantiated however. Search was made in 24 additional counties in Virginia without finding the disease. The accompanying map shows the general locality of the counties from which nematode has been reported.

In Virginia, the disease appeared to be most serious in the region of Rockingham, Shenandoah and Albemarle Counties. In Rockingham County, 20% nematode galls were found in the wheat on one farm and about 50% galls were found in the screenings at one of the mills. A field of wheat with 54% galls was found near Woodstock in Shenandoah County and another with 50% at Morrisville, Fauquier County. On the whole, however, the percentages of diseased wheat were very small, being in many cases only a trace in the screenings at some of the mills. The high percentages occurred only in isolated instances. The actual average loss for the state, therefore, will be small.

The disease is thought to have been present in Virginia for a considerable length of time. Some farmers stated that they noticed the disease as long as 30 years ago and many of them have observed it for ten to fifteen years.

Virginia farmers do not make a practice of changing their seed very often, but use their own wheat for a number of years. If it becomes unsatisfactory they usually replace it with some from a neighbor. This practice tends to keep the disease more or less localized. In some of the counties where the disease is worst, wheat is commonly planted two or even more years in succession on the same piece of land. This, of course, tends to increase the amount of disease in each succeeding crop.



Found also in Jackson County, Georgia.

Fig. 6. Map of Maryland, Virginia, and West Virginia showing location of counties from which wheat nematode has been reported.

The only control commonly practiced has been the use of new seed on farms where the disease becomes troublesome. Virginia officials plan to reduce the disease by encouraging the use of the salt brine method of seed treatment and crop rotation.

Black chaff caused by Bacterium translucens var. undulosum.
Smith, Jones and Reddy.

Black chaff was reported by collaborators in 1918 from Indiana, Wisconsin, Iowa, Missouri, Arkansas, Kansas, Nebraska, Oklahoma, South Dakota, and Montana. Suspicious cases were also reported by collaborators in Alabama, Tennessee, and West Virginia, but because of the somewhat uncertain identity these are not listed as definite occurrences. Prior to 1918, the disease had not been found east of Illinois, but during the 1918 season it was located in Indiana, and the suspicious cases already mentioned were found in states still further east.

The disease undoubtedly caused considerable loss in some states, especially in Montana, Iowa, and Nebraska. In Montana, abundant instances were seen where the reduction in yield was estimated by H. M. Jennison as 50%, and cases were seen where 80-90% loss was incurred. In this state it was found doing damage everywhere. J. D. More reported the following percentages of affected plants in states visited:

- Oklahoma - Medford 1%, most fields without any.
- Kansas - Winfield 20%, localized in spots.
McPherson 20%, localized in spots.
- Nebraska - Beatrice 18%, general in most fields.
Fullerton 5%, general in local fields.
- South Dakota - Miller 5%, general in local fields.
Mitchell 5%, general in local fields.

On one farm in Gage County, Nebraska, practically all plants were attacked and the yield was reduced about 25%. A spotted occurrence was mentioned by a number of observers. It was noticed that in low spots of a field or in areas where the wheat was particularly heavy the disease was worst.

Turkey Red wheats were reported as more susceptible than other sorts in Iowa and Missouri. In Montana, 20% injury was reported to spring wheat with only 1% to winter wheat.

Glume spot and leaf spot caused by Septoria spp.

Septoria was commonly reported from practically all over the eastern half of the United States. The only report from New England, however, was from Connecticut where the diseases are said to be new. The fungi appeared to be most abundant in the North Central and Middle Atlantic States. In no place was the glume spot said to be causing any particular damage, but the disease of the leaves was mentioned in a number of instances as probably being injurious to the crop.

Septoria was said to be especially prevalent in Alabama on Alabama Blue Stem, while in Ohio, it was reported as being most abundant on Velvet Chaff and other wheats with hairy glumes. In Ohio, it was very abundant on winter wheat, but practically absent from spring wheat.

Anthracnose caused by Colletotrichum cereale. Manns.

Anthracnose was reported in wheat from Pennsylvania, Virginia, Ohio, Georgia, Alabama, and Minnesota. The disease was by far the worst in the first three states named, in all of which, it was more prevalent than usual. In Ohio, it approached an epidemic, being present in every county inspected in amounts ranging from 2-26% affected plants. The losses in the northern part of Ohio were said to exceed those from scab. For the entire state a loss of 4% was estimated. In Virginia, the disease was especially serious in the south central portion of the state. As much as 10% damage was observed in some fields while the general average loss for the state was placed at 1%. In the southern and western states, the disease seems to have been of practically no consequence. It was first noticed May 1 at Athens, Georgia.

Ergot caused by Claviceps purpurea. (Fr.) Tul.

Ergot seems to be increasing on wheat in some of the north central states, as last year it was reported from Illinois, Wisconsin, Minnesota, North Dakota, and Nebraska. In no state, did it do more than a trace of damage, although in Wisconsin two fields were found with about 1% affected heads.

Powdery mildew caused by Erysiphe graminis De C.

Powdery mildew was common, as usual, in the eastern part of the country. It was reported from New England, New York, Pennsylvania, Maryland, Ohio, Kentucky, Tennessee, Colorado, Montana, Washington, and Oregon. Judging from these reports, it was most abundant in Pennsylvania. In this state, it probably caused some loss. Observers mention mildew

as being most abundant in the moister and shady portions of fields. It was first noticed by dates as follows:

June 8 - Oregon
 June 21 - New York
 July 3 - Connecticut
 July 4 - New Hampshire
 July 5 - Pennsylvania

Other diseases.

Winter killing was common and caused heavy losses in the northern portion of the country, especially in New England, New York, Michigan, Wisconsin, Minnesota, Montana, Idaho, and Washington. In New York, where a special effort was made to determine the extent of injury, the average of 48 reports from 34 counties showed 37% of the crop injured. All varieties in the state are equally injured.

Stripe and blight, thought to be caused by Helminthosporium sp., was reported from Montana in many spring wheat fields. It was found at its worst in the south central part of the state. As high as 75% of the leaf blades in some fields were affected. It did the most damage to Marquis wheat. What was apparently the same disease was reported in 1916 from the western part of the state.

The following description of the disease was furnished by H. M. Jennison:

"The leaf blades are affected, the lower ones first and later the upper. The young lesions vary in size, are usually longer than wide, rather irregular in outline, with a light brown margin and darker center. Older lesions are longer, forming stripes that are quite uniformly light brown in color. Severely affected plants show systemic effects. The heads are often very light and in many cases there is a noticeable failure to fill at the tip."

The same or a similar leaf stripe, said to be due to Helminthosporium, was reported from New York in 115 fields in 11 western counties. An average of 10% of the leaves were affected in the 115 fields, but the actual damage was slight.

From North Dakota, H. L. Folley reported considerable blighting of wheat plants in old crop regions which was thought to be due to infection by Helminthosporium.

RYE

Ergot caused by Claviceps purpurea (Fr.) Tul.

Ergot was reported from most of the states in the northeastern part of the country, as far west as the Dakotas and as far south as Oklahoma, Arkansas and Georgia. It appeared to be most abundant in Ohio, Indiana, Illinois, and Michigan. In these states, and also in Connecticut, Iowa, and North Dakota, it was said to be much more abundant than usual. In the remainder of the states the disease apparently occurred in about the normal amounts.

The loss from ergot to the crop in bushels is not excessive for as a rule only a few (2-3) of the kernels per head are affected, and the percentages of affected heads do not usually average very high for any one entire field. The percentage reduction in yield of grain estimated as being due to ergot in 1918 and the approximate number of bushels lost is given in the following table:

Table XXI. Estimated reduction in yield of rye because of ergot, United States, 1918.

State	Percentage affected kernels	Bushels
Massachusetts	trace	+
Connecticut	"	+
New York	"	+
New Jersey	.3	4,000
Pennsylvania	.5	21,000
Georgia	trace	+
Illinois	.2	8,000
Michigan	trace	+
Wisconsin	.21	16,000
Minnesota	.13	11,000
Iowa	.23	2,000
Missouri	trace	+
North Dakota	.01	2,000
Nebraska	trace	+
Kansas	"	+
Kentucky	"	+
Arkansas	.2	+
United States	.07	64,000+

In addition to the bushel loss, the dockage in price made by the millers and the dangers of stock poisoning are factors that should be taken into consideration on estimating damage.

Some commercial rye fields were found with as high as 20-30% ergotized heads, but this was the exception. The disease was not uncommonly found, however, affecting as high as 90% of the spikes in volunteer rye appearing in wheat or other crops on land that had been planted with rye the previous year. In certain wheat fields, where there was considerable affected volunteer rye the wheat was often reported with ergot.

Indications are that ergot is increasing in amounts and destructiveness in the larger rye sections of the country. The following reports of collaborators in various rye growing states are of interest.

North Dakota (Holley), "Claviceps purpurea is to become one of the most common of the destructive diseases. Conditions here, such as the presence of native wild grass hosts and perhaps climatic conditions, seem to be particularly favorable. Infection was certainly more intense, in some fields at least, this year than last. These intensely affected fields seem to be in neighborhoods where rye is most commonly cropped or on land where rye follows rye most closely."

Illinois (Anderson, H. W.), "Observations have been made on the occurrence of ergot in the vicinity of Lafayette, Ladoga, and Crawfordsville, Indiana; and Urbana, Champaign, Springfield, and Rantoul, Illinois.

Reports have also been received from other places in the latter state. Everywhere I have been in Indiana and Illinois I have found ergot running from 2-10% in rye fields. In fields where rye has been mixed with wheat and where sometimes 1/10 of the field is rye the ergotted heads run very high. In one field, I found 90% of the heads having ergot. In two timothy fields, I also found 90% of the volunteer rye ergotized. It seems well to call attention to the unusual prevalence of ergot at this time on account of the danger of stock poisoning. For a number of years I have watched ergot about Ladoga, Indiana, and each summer have had difficulty in getting sufficient material for class use. I know, therefore, that the condition this year is very unusual. One remarkable thing is the greater amount of infection in the edge of the field than in the central portion. Twenty percent as compared to 5% is the usual condition.

"About Springfield, Illinois, we have found heads of wheat with ergot rather abundant, and about Urbana and Champaign Agrostis alba has been found heavily affected."

Michigan (Woodcock, E. F.), "The disease is quite general in the state. Fifty-five percent of the fields visited showed the heads infected. In only one field, was the percentage of infected heads over 3%. This particular field showed 75%. The soil was poor and the grower failed to practice rotation of crops."

Seed treatment for the control of ergot does not seem to be commonly practiced although, where used, the salt brine method is said to give good results when the seed is planted on clean soil.

Stem smut caused by Urocystis occulta (Wallr.) Reb.

This smut was reported from most of the states in the northeastern quarter of the United States and also from Oklahoma, Texas, Alabama, and the Carolinas. In the eastern states, such as New England and the Atlantic States, the disease seems to be rare and not of any special economic importance. In the North Central States, from Ohio west, however, it is reported as causing some damage. It is estimated that on the average it caused state losses ranging from .2% to 1.3% in these North Central States, and because of the wide range of the disease in this important rye region and the nature of the malady itself it is thought to have caused heavier losses for the United States as a whole than did ergot.

Reports seem to indicate that the disease was present in about the same amounts as usual. Formaldehyde treatment of the seed grain does not seem to be at all common and on the whole may be unnecessary except in local instances. The treatment is said to be used in Minnesota to some extent.

Stem rust caused by Puccinia graminis Pers.

Stem rust was reported from practically all states east of the north and south line running from the western boundary of the Dakotas through Texas. No 1918 reports are at hand to indicate occurrence west of that line. In most all states, the disease was of very slight importance and was usually scattered. It probably caused the heaviest losses in Wisconsin. It occurred widely all over this state and many fields showed 100% infection.

Leaf rust caused by Puccinia dispersa Erik.

Leaf rust was reported from all over the eastern half of the United States. Information on the occurrence of this rust was collected by men from both the Cereal and Plant Disease Survey Offices. The disease was most common and in some cases destructive in such states as Virginia, North Carolina, Ohio, Kentucky, Tennessee, Missouri, and Arkansas. The following figures show the percentage of affected leaf area in states where counts were made by men from the Survey Office.

Table XXII. Percentages of leaf area affected with leaf rust as found by survey men in May, June, and July, 1918.

State	Average % affected leaf area	State	Average % affected leaf area
New York	16	Ohio	27
Pennsylvania	12	Illinois	t
Virginia	25	Michigan	26
Kentucky	37	Wisconsin	10
Tennessee	42	Iowa	3
North Carolina	52	Missouri	20
South Carolina	3	Arkansas	37
Georgia	3	Nebraska	t
Alabama	15		

One field of rye was reported in northern Indiana which on June 23 was in such a bad condition from leaf rust that the crop was no higher than lawn grass and only a few plants were able to form heads. When one walked through this field a red cloud of rust spores was evidenced.

Although the field men were on the watch for differences in varietal susceptibility none was noticed.

Anthracnose caused by Colletotrichum cereale Manns.

Anthracnose was reported from Pennsylvania, Virginia, Tennessee, Louisiana, Oklahoma, Ohio, Missouri, Wisconsin, and Minnesota. In Pennsylvania, 2-5% of the crop was reported injured, in Virginia 3-5%, in Missouri 3-5%, and in Tennessee and Ohio was severe in some sections. In certain individual fields the reduction in yield because of anthracnose was reported as high as 33% (Minnesota), 50% (Missouri, Fayette), 50-60% injury (Oklahoma).

Other diseases.

Powdery mildew (Erysiphe graminis DeC.) was reported from a number of states but particularly from Massachusetts where it is estimated that it caused 2% damage. In that state it was the worst rye disease. In many fields the foliage was completely destroyed and in others from 50-80% of the leaves died prematurely.

Scab, caused by Fusarium spp., is commonly reported on rye. This year it was reported as follows: Connecticut (two reports, first seen July 3.), Minnesota (trace), Missouri (slight), Tennessee (5% injury, reported June 1), Wisconsin (trace reported first in July), and Iowa (reported from nine counties by men engaged in cereal survey).

Wilt, thought to be caused by a fungus in the culm, was reported by Clinton from Connecticut. The stalks of affected plants turn yellow before maturing heads and are thus easily distinguished from those of healthy plants with green stems. Occasionally entire stools are killed. The disease was seen most easily in June and not so readily recognized later.

It was quite common in some fields all of which were located in New Haven County.

Rhynchosporium graminicola Hein. was reported on rye by Vaughan from Wisconsin. It occurred in small amounts in a number of fields throughout the central part of the state but was of decidedly minor importance. It was first noticed in May.

Sterility of rye was said to be very common in Pennsylvania. Specimens received at the Experiment Station would seem to indicate as high as 50% sterile spikelets about the state.

BARLEY

Loose smut caused by Ustilago nuda (Jens.) Kell. & Sw.

Loose smut undoubtedly occurred, at least in small amounts, in practically every locality where the crop was grown. Fortunately it was worst in states other than those that rank first in the production of barley. Thus in Wisconsin, Minnesota, and the Dakotas, the disease although common was not especially destructive except in small local areas. The average loss for Wisconsin is estimated at about .8%, while that for Minnesota and the Dakotas probably did not exceed 1%. The heaviest losses are recorded from Indiana (6%, about 9% loss in nine counties surveyed in central-western part of state), Oklahoma (8%), Mississippi (7%), Alabama, Tennessee, and Maryland. A report of the losses by states is given in another number of this Bulletin (Pl. Dis. Bul. Supl. 6, 1919.). The total loss for the United States is given as .9% or 2,381,000 bushels.

Pennsylvania reported perfect control with hot water, Wisconsin reported good results by soaking two hours in formaldehyde, and in New York experiences indicated that the dry (spray) formaldehyde treatment can be used in controlling the disease in two-rowed barley, but not in other varieties.

Covered smut caused by Ustilago hordei (Pers.) Kell. & Sw.

Covered smut seemed to be even more widely distributed than loose smut and was responsible for a greater loss to the country as a whole. In the northeastern portion of the United States, including Indiana, Ohio, and Tennessee, it was not generally so severe as was loose smut. In Michigan, Iowa, Missouri, and Kansas the two smuts seemed to be of about equal prevalence, while in the remainder of the country, and this includes the great barley producing states, covered smut was the more important of the two diseases.

Covered smut is reported as being satisfactorily controlled where formaldehyde is used, but the high percentages of smut indicate that seed treatment is not employed widely enough.

Stripe caused by Helminthosporium gramineum (Rab.) Erik.

Stripe is now recognized as one of the most serious barley diseases and ranks in importance along with smuts. Last year it was widespread over the country from Oregon to New England and has become well established, particularly in the principle barley producing sections. It is only until comparatively recently, however, that pathologists have recognized the disease as of a serious nature and needless to say it is still unknown to many county agents and farmers. Although formaldehyde (1-40 for 2 hours) has been reported as giving good results in Wisconsin, the control measures are not fully understood and so are not generally practiced.

In Wisconsin, observations were made during the summer in 540 fields of barley and an average of all counts made showed the disease to be present to the extent of 5.2% affected plants. Since the disease is systemic and causes a failure of the heads to mature 5.2% diseased plants means that much loss. The amount varied from 0 to 50%. It is said to have been more abundant in 1918 than in 1917.

In Michigan, observations were made in 53 fields in 12 counties by E. F. Woodcock. The disease was present in 76% of these fields and in 34 of them it was present in amounts of more than 1%. The average amount of disease in the entire 53 fields was about 3.8% (trace min. to 30% max.). The disease occurred commonly on native as well as introduced seed, showing that it has become well established. It appeared, however, that stripe occurred in higher percentages in various pedigreed varieties than in the common run of barley. It is stated that in Michigan the disease is of more importance than either of the smuts.

In Indiana, E. H. Toole made examinations in 18 barley fields in the northern part of the state. Stripe was present in six fields, ranging in amounts from a trace to 10%.

In Minnesota, the disease is very common and widespread and occasionally found running as high as 40% in individual fields. It is said to be as prevalent as covered smut and is estimated as causing about 1.4%, or 570,000 bushels, loss in the state in 1918.

Net blotch caused by Helminthosporium teres Sacc.

Net blotch occurred throughout the northern part of the United States, but did little or no damage except in certain parts of Wisconsin. In Rusk and Taylor Counties of that state, 100% of the plants are reported affected, but for the state as a whole the loss is small. In Emmet and Chippewa Counties, Michigan, 50 and 56% disease was reported respectively. In the other states, net blotch occurred in slight amounts only, and the loss was inappreciable. Texas is the only southern state from which it was reported and there it occurred in only slight amounts in one county.

Spot blotch caused by Helminthosporium sativum (Pers.) K. & B.

This disease, while occurring quite widely over the northern part of the country, is apparently not causing much damage and is relatively unimportant. It seems to be most general in Wisconsin, but even in this state

is mostly in the southern part. In the other states, also, it appears to be more or less localized. The disease has not been noted west of the Rocky Mountains, and Texas is the only southern state from which it has been reported. E. H. Toole reports a case at Wingate, Indiana, where the fungus attacked young plants and in places in the field 5% of the plants were dwarfed or killed in addition to the blotches covering 5% of the leaf area of all plants.

Stem rust caused by Puccinia graminis Pers.

Stem rust was not very prevalent in 1918 nor did it do much damage to the barley crop. It occurred in spots or areas of various sizes and in many cases the relation of the presence of barberry bushes to these local occurrences was very evident. A large number of observations showing this relation were made by persons engaged in the "Barberry Eradication Campaign" and by others. Many of these spot infections extended over as large an area as a county and in some of these the disease was severe. Thus in Sawyer and Winnebago Counties, Wisconsin, there was 100% and 28% heavy infection, respectively, while in the majority of the other counties the disease was less severe or entirely absent. In Minnesota some counties showed as high as 28%, 18%, and 13% disease while other neighboring counties would have only a trace or none at all. In general, these two barley states suffered the most loss from the disease of any.

Stem rust appeared later than usual and so did not do much damage. Furthermore, it is probable that the work of eradicating the barberries, at least in some sections, was responsible for a considerable suppression of the disease. As the work progresses, the results of this effort should be still more evident.

Leaf rust caused by Puccinia simplex Eriks. and Henn.

This disease, which has been reported in years past most frequently from west of the Rocky Mountains, was reported this year from a number of states east of the Mississippi River. It was reported by collaborators from Vermont, Massachusetts, New York, Tennessee, Indiana, Michigan, Wisconsin, Minnesota, Iowa, Missouri, South Dakota, Montana, Colorado and Oregon. Scouts of the Plant Disease Survey found it also in Kentucky.

The following percentages of affected leaf area were found by field men of the Plant Disease Survey:

New York	trace	Iowa	trace
Indiana	1.8	South Dakota	.3
Michigan	trace	Kentucky	60.
Wisconsin	.1	Tennessee	33.

In no case did there appear to be any reduction in yield. Examinations in Alabama, Georgia, South Carolina, North Carolina, Virginia, Maryland, Pennsylvania, Ohio, Illinois, Missouri and Arkansas failed to reveal its presence.

Yellow stripe caused by Puccinia glumarum (Schm.) Er. & Hw.

Reported as being of negligible importance in Oregon.

Leaf spot caused by Rhynchosporium graminicola Hein.

Reported from California (considerable locally) caused considerable damage in experimental plots at Chico, Minnesota (common), Oregon (more severe than usual, very heavy infection noted in some fields in west and about Corvallis, not observed in southern counties); Washington (moderate) and Wisconsin (slight locally).

Anthraxnose caused by Colletotrichum cereale Manns.

Reported from Minnesota and Iowa. In the latter state, it was said to be common and probably doing considerable damage.

Powdery mildew caused by Erysiphe graminis DeC.

Reported from Vermont (common in fall), Connecticut (not bad this year), New York (trace in nearly all fields) and Indiana (rather heavy in a few cases).

Ergot caused by Claviceps purpurea (Fr.) Tul.

Ergot is not commonly reported on barley, but this year it was found in Indiana, Michigan and Wisconsin. In the latter state, the disease was first reported in July and was limited in extent but more abundant than is usually the case.

Other diseases:

A bacterial leaf blight of uncertain cause, and causing only slight damage was reported as general in Wisconsin, particularly in the southeastern portion of the state and in Indiana, near Lafayette. Another disease which may or may not be the same was observed by Reddy and Jennison in Montana affecting the basal portions of the leaves and causing some damage in at least one field of "purple hulled" variety. Ohio also reports a leaf blight of a bacterial nature.

Scab, caused by Fusarium spp., was reported from Wisconsin (local, but more than 1917) and Minnesota (local, trace).

Root rot, of uncertain cause but tentatively ascribed to a species of Rhizoctonia, was reported from Washington.

Root rot, caused by Fusarium sp., was reported from Minnesota.

False stripe was reported from New York (common about Ithaca), Indiana and Wisconsin.

Frost injured barley considerably in northern Indiana and southern Michigan, June 23. Some fields were killed down completely when well headed out.

OAT

Smut caused by Ustilago avenae (Pers.) Jens. and U. levis (Kel. & Sw.) Mag.

The oat smuts occurred widely in all states. They were prevalent in about the same amounts as usual although for the country as a whole there was probably less smut owing to the seed treatment campaign carried on by the Depart-

ment of Agriculture cooperating with the states. Thus, in 1917, the estimated average amount of smut for the United States was placed at 5.26% (Pl. Dis. Bul. 2:8, 1918) while the estimates of the Plant Disease Survey for 1918 show only 4.2% for the entire country, an apparent reduction of about 1%.

The aggregate loss to the oat crop from these two smuts is enormous. The 5.26% loss to the crop in 1917 amounted to about 91,655,000 bushels or almost as much as our export during that calendar year. The 4.2% loss estimated for 1918 and which is based on actual counts in many fields is equivalent to a loss of at least 64,396,000 bushels. The following table shows the determination of percentages of smut by states as made by field men engaged in the cereal survey of 1918. The final estimates of the Plant Disease Survey, which will be published later, are somewhat different from these.

Table XXIII. Average percentages of oat smut, loose (*Ustilago avenae*) and covered (*U. levis*), as found by field scouts of the Office of Cereal Investigations, 1918.

State	Production: 1918 Bushels (000 omitted	No. of fields inspect- ed	Average: % oat smut	State	Production: 1918 Bushels (000 omitted	No. of fields inspect- ed	Average: % oat smut
Me.	6,760	231	2.4	Mo.	44,196	493	4.4
N. H.	912	103	3.	N. D.	60,512	78	4.8
Vt.	4,223	209	2.8	S. D.	84,240	101	3.2
Mass.	480	27	4.6	Neb.	56,188	111	4.8
R. I.	84	14	6.5	Kans.	51,238	144	3.9
Conn.	912	80	2.5	Ky.	9,600	25	5.
N. Y.	51,660	558	3.3	Tenn.	8,125	62	4.5
N. J.	3,400	29	2.3	Ala.	8,132	568	5.
Penn.	47,190	91	3.9	Miss.	5,600	231	5.
Del.	175			La.	2,000	94	2.7
Md.	1,980	10	1.4	Texas	22,197	209	8.7
Va.	5,175	16	6.	Okla.	33,120	184	5.6
W. Va.	4,320	9	1.8	Ark.	11,271	106	5.6
N. C.	6,500	88	8.2	Mont.	20,400	53	1.9
S. C.	11,000	68	6.2	Wyo.	11,685	24	2.5
Ga.	12,000	142	7.6	Colo.	9,669	16	5.5
Fla.	1,080			N. Mex.	1,260		
Ohio	79,200	45	7.2	Ariz.	440		
Ind.	85,050	393	3.6	Utah	4,410		
Ill.	198,352	53	6.6	Nev.	532		
Mich.	66,320	230	4.	Idaho	9,480		
Wis.	110,162	359	3.	Wash.	8,370	235	2.9
Minn.	134,562	558	2.6	Oreg.	9,025		
Iowa	229,572	347	1.1	Calif.	5,600	27	1.6

In connection with the attempt to learn more about the geographical distribution of the two kinds of bunt on wheat as reported page 119, a similar effort was made also with respect to the oat smuts. A summary of questionnaires has yielded the following results.

Table XXIV. Number of individual collections of loose smut (Ustilago avenae) and covered smut (U. levis) in various states and Canada as shown by replies of collaborators and others to questionnaires. Determinations based on microscopic determination.

State : Number of collections				State : Number of collections.			
		: Ustilago avenae: Ustilago levis:				: Ustilago avenae: Ustilago levis:	
Me.	-	:	1	S. D.	1	:	4
N. H.	2	:	-	Nebr.	6	:	5
Vt.	3	:	2	Kans.	-	:	1
Conn.	7	:	3	Ky.	1	:	-
N. Y.	19	:	7	Tenn.	4	:	-
Penn.	3	:	-	Texas	2	:	1
Va.	2	:	5	Okla.	1	:	-
N. C.	2	:	3	Mont.	1	:	1
S. C.	-	:	1	Wyo.	1	:	2
Ind.	1	:	10	N. Mex.	2	:	12
Ill.	7	:	5	Utah	-	:	7
Wis.	24	:	46	Idaho	-	:	2
Minn.	37	:	23	Wash.	16	:	4
Iowa	5	:	4	Ore.	6	:	18
Mo.	390	:	240	Canada	17*	:	10+
N. D.	3	:	2			:	

* Reported from each of the following: Quebec, Prince Edward Island, Ontario.

+ Reported from each of the following: Quebec, Prince Edward Island, Ontario, Manitoba, Saskatchewan, Alberta, and British Columbia.

Treatment of the seed with formaldehyde was undoubtedly far more widely practiced than usual owing to the stimulus of the seed treatment campaign. Reliable data are not at hand to show the extent to which seed treatment was practiced. In some states, it is known that the great majority of farmers treated while in others, cases of treatment were rare.

A number of states such as New York, Georgia, Ohio, Michigan, and Kansas reported very good results with the dry, pint to pint method.

Stem rust caused by Puccinia graminis Pers.

Stem rust was reported from most parts of the country. Nevada is the only state west of Colorado that reports the disease and there only a small amount is mentioned as occurring. In general, the disease caused less loss than usual and was, in no state, a serious factor. For the most part it occurred locally and in small amounts. In South Dakota and Minnesota, stem rust was said to be more common on late than on early oats. Like the leaf rust, this disease was rather more severe in the southern states, probably being influenced by the fact that the majority of the southern oats are sown in the fall.

Leaf rust caused by Puccinia coronata Cda.

Leaf rust occurred widely over the country as far west as Colorado and Arizona. No reports were received of its occurrence from the Pacific Coast States. The disease was most serious to oats in the southern states,

thus Florida reports leaf rust and stem rust as the two most serious oat diseases and in Louisiana all the plants were said to be affected and a loss of 5 to 10% is estimated for the state. Much of the oat crop in the South is fall sown which probably accounts for greater losses from leaf rust in that portion of the country. The amount of injury apparently became increasingly less farther north.

The following estimates of damage were made by collatorators:

Vermont.....75% injury	Pennsylvania...50-75% injury, 2% loss
Massachusetts..Trace injury	West Virginia..10% injury
Connecticut....1/4% injury	Kentucky.....5% loss
New York.....Very slight injury.	Tennessee.....Severe in some sections
S. Carolina....80% injury	Missouri.....Less than 1% injury
Georgia.....Loss small	Minnesota.....Small loss
Louisiana.....Practically 100% injury	Colorado.....Small loss
	Arkansas.....1% injury

The rust was reported as first being noticed on oats in 1918 as follows:

April.....Louisiana	July 3.....Connecticut
April 15.....Tennessee	July 20.....Minnesota
May 20.....Georgia	August 1.....Pennsylvania
June.....Oklahoma	August 1.....Vermont
June.....Wisconsin	

A close association of badly infested fields with *Rhamnus* was noted in Wisconsin. It is probable that further careful surveys would show similar relations in other states.

Anthracnose caused by Colletotrichum cereale Manns.

Reported from Ohio (Prevalent in northern part, 25% stalks attacked in some places), Minnesota (Trace), Iowa (Prevalent in central part).

Leaf blight caused by Helminthosporium sp.

Reported from New York (Present in all fields inspected in Yates, Ontario, Monroe, and Genesee Counties, but only a trace of injury), Wisconsin (Limited as usual, only very slight injury).

Sterility, cause not definitely known.

Reported from New York under the name of blast (Monroe, Tompkins, and Franklin Counties, only slight loss), Pennsylvania (General and about as usual, average estimated loss about 6%; Huntingdon County about 20% loss, Erie County about 10%, Cumberland, Luzerne and Clarion Counties 5%), Michigan (No special injury), Minnesota (General, about as usual, perhaps 1% of crop injured, some individual fields badly blasted), Iowa (Very prevalent on all varieties), North Dakota (Considerable complaint and many specimens received showing considerable damage).

Bacterial blights

Reported from New York (Western portion, only very slight injury), Ohio (Williams, Paulding, Van Wert, Union, Wayne, and Columbia Counties), Wisconsin (More than usual, widely scattered, only a trace of loss), Kansas (Halo blight rare), Montana (Typical halo blight lesions were found on the majority of plants in a single field of oats, the seed for which came from North Dakota. Evidence pointed to control through seed treatment. The occurrence of what appears to be another bacterial disease of oat leaves was noted in several localities. The presence of a dry bacterial ooze was noticed in several cases), Arkansas (A bacterial blight is general in state, particularly in the north, injuring about 1%).

Other diseases

Powdery mildew, caused by Erysiphe graminis, was reported as common in parts of Washington and Oregon.

A root rot of a serious nature but of uncertain cause was common and destructive in parts of western Washington on oats as well as on wheat (See wheat).

A Rhizoctonia root rot was reported from Minnesota.

Red blade of oats, due to sub-normal temperatures during early growth, was reported from many places in Washington.

Scab, caused by Fusarium spp., was reported on oats by Professor Selby in Wayne and Summit Counties, Ohio, and by J. D. More from one field in South Dakota.

CORN

Smut caused by Ustilago zeae (Beck.) Ung.

Corn smut, which occurs all over the United States, was probably somewhat more prevalent than usual when the country as a whole is considered. In the western portion of the corn growing region, it was apparently of considerable more than normal importance. In this section of the country, from North Dakota south to Texas, and including Colorado, the disease was severe and is apparently increasing yearly in amount and becoming a very serious problem. In the western part of Nebraska, 50% of the stalks were affected, while in Colorado, the loss was seldom less than 10% in any individual field and many plantings showed as high as 50% reduction in yield because of smut. Counts made in a number of Colorado fields showed as high as 40-60% diseased plants. In North Dakota, the disease is reported by Polley as being very prevalent on new lands indicating that the spores are either seed-borne or else wind-blown long distances.

In the remainder of the corn belt, the disease did much damage. In Ohio, Illinois, and southern Michigan, it was thought to be rather worse than the average. Two states report sweet corn as being injured more than field corn.

Another section of the United States where the disease is a serious problem but on a smaller scale is the Carolina-Georgia area. Here smut is

especially prevalent on the bottom lands of river valleys where good growth is secured and where little or no rotation of the crops is practiced. In South Carolina 20% of the crop was reported injured and 2% lost, while in Georgia, the average loss for the state is estimated at 5%. Indications are that corn smut is perhaps a more serious factor in reducing corn yields than has generally been realized and deserves more attention than has been given it in the past.

Rust caused by Puccinia sorghi Schw.

Rust was reported from most of the states in the eastern half of the country. In general it occurred in about the usual amounts but in Pennsylvania, Kentucky and Arkansas it was thought to be somewhat less than usual. While indications are that in Wisconsin, Minnesota, Iowa and Nebraska it was somewhat more serious than the average.

This disease is co-extensive with the corn states, and has never been reported to the Survey from Montana, Wyoming, Colorado, New Mexico nor states west with the exception of California where it was slight locally in 1910. From a comparison of reports of former years the disease seems to be most important in the southeastern states, including Louisiana (sometimes severe), Arkansas, Missouri and Iowa.

The losses caused by rust are small because the disease usually develops late in the season when corn is approaching maturity, and when a reduction in the leaf area is not especially harmful. When late planted corn is severely attacked however, as is sometimes the case, the reduction in yield may be appreciable.

Both field and sweet varieties were reported affected.

Brown spot caused by Physoderma zeae-maydis Shaw.

Physoderma developed in the Mississippi Valley during the early part of June but was checked by dry weather which lasted until about the middle of July. This dry period, although unfavorable to the corn crop of the South, greatly inhibited the fungus and undoubtedly prevented much loss. After the middle of July rains were more frequent so that the disease made considerable progress and caused more or less damage.

Physoderma was reported as being the cause of the most important corn disease in Georgia where it was general over the state, but especially noticeable in the mountain valleys of north Georgia and the Coastal Plain area. In these regions many fields showed 100% infection and some fields showed from 5 to 20% of the stalks broken down as a result of weakening at the nodes. One small patch in Rabun County was observed where the corn seemed to be entirely broken down and destroyed by Physoderma and the numerous attending saprophytes. It was estimated by Collaborator Berry that the crop was injured in half of the fields of the state and that an average loss of about 10% was sustained.

Berry reported the disease worst in the moist, rich, bottom lands. Heavy applications of nitrogenous fertilizers such as barnyard manure seemed to favor it. The lack of proper crop rotation on many of these bottom lands of the South affords excellent opportunity for the continued propagation of the parasite in the soil.

South Carolina, as well as Georgia, suffered considerable loss (estimated at 5%). The disease was apparently more severe in these two states than in any other part of the South although it was very common

in other sections, particularly in Mississippi, Louisiana, Arkansas, Alabama, and Tennessee. In the latter state the disease is said to be increasing and caused a loss of 100,000 bushels last year.

The accompanying map shows the distribution and severity of the disease in 1917 when a survey was made by the Plant Disease Survey and the Office of Cereal Investigations.

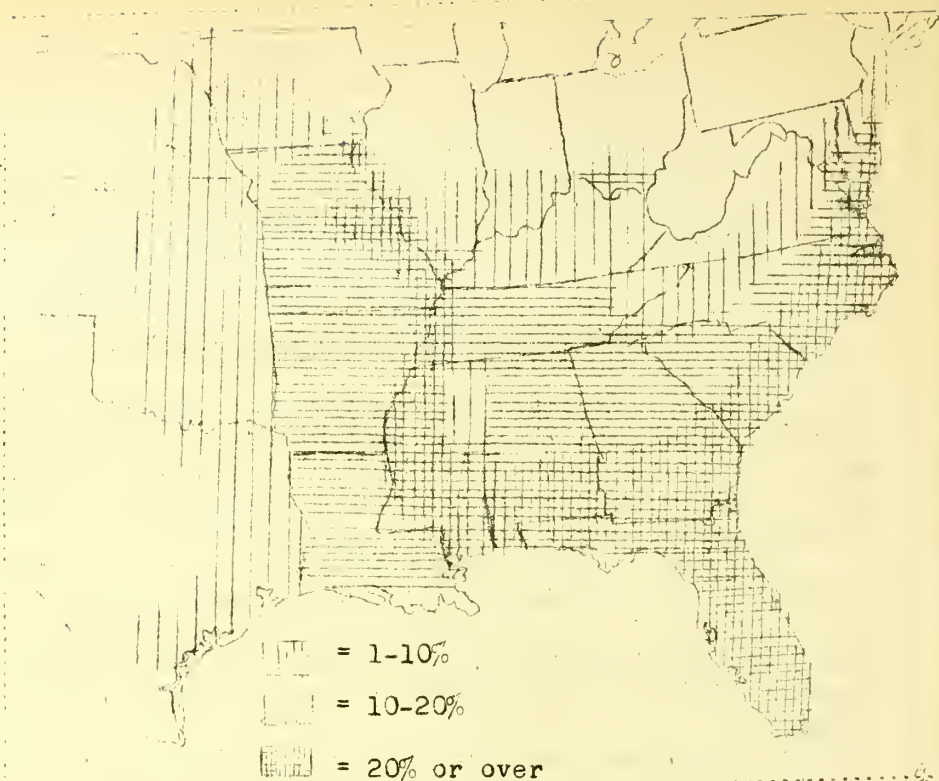


Fig. 7. Geographic range and relative abundance of *Physoderma* on corn, 1917.

Bacterial wilt caused by *Bacterium stewartii*. E. F. S.

Bacterial wilt was observed in a number of states in the eastern portion of the country causing slight losses locally to sweet corn. In most places where the disease was noticed, only a trace to 2 or 3% of the plants were affected but in some fields as high as 15% (Virginia) disease was evident. In general, the disease can be said to be relatively unimportant, but since it is capable of causing large losses it should be guarded against, especially in the large commercial sweet corn districts. Stowells Evergreen and Golden Bantam are mentioned as susceptible. It was observed on field corn in Tennessee by F. V. Rand, who made a large number of collections of the disease during the season in various states.

Root, stalk, and ear rots caused by *Fusarium* spp.

Fusaria were reported as causing root, stalk, and ear rots of corn in all of the corn states. At least one or more of these troubles were said to occur in all states east of, and including South Dakota, Nebraska, Kansas, Oklahoma, and Texas. Northern New England is excepted. It can not be said with certainty at this time in which states the troubles were worst.

A special survey was conducted by the Department of Agriculture in the summer of 1918. The outstanding results of this work have been given in an earlier number of this bulletin (Pl. Dis. Bul. 2:222-236, 1918.). It may be added that the greater amount of these troubles can be traced to the use of poor and infested seed for planting. It was also observed that where corn was planted continuously on the same land the rots were more

severe. Fields of low fertility or poor drainage or that were unfavorable for corn in other ways usually showed the highest amounts of disease.

The relation of these rots of the different parts of the plant and the identity of all the pathogenes concerned is being worked out by G. N. Hoffer at the Agricultural Experiment Station, Lafayette, Indiana.

Other diseases.

Leaf blight, caused by Helminthosporium sp., was reported from New Jersey (reported as inconspicuum) as common, Florida (first report from state said to be severe), Louisiana (common), Mississippi (very slight locally), Pennsylvania (general, about as usual, 35% field corn affected, 65% infection in 5 acres of Golden Bantam sweet corn), Ohio (reported as graminium species).

Ear rot, caused by Diplodia sp., was reported from West Virginia (noticed in a number of fields but not thought to cause much loss), Ohio (reported from nine counties), and Washington (Spokane).

Root rot, caused by Bacillus sp., and similar to Furrills Illinois disease was reported by M. T. Cook as very severe in places in New Jersey.

Sclerotium rolfsii was found on one corn plant near Brownsville, Texas, by L. R. Hesler, May 7.

Rhizoctonia sp. was reported from Ohio and Washington.

Cladosporium was reported from Washington, occurring as a mold of the kernels.

Aspergillus sp. was reported from Texas causing mold of ear.

"Frenching" of corn, the cause of which is indefinite, was reported as general in southeastern Georgia. In this section of the state some individual fields were a total loss. First reported May 15. Said to be most severe when hot dry weather follows a wet season.

RICE

Blast caused by Piricularia grisea (Oke.) Sacc.

Blast was reported from Georgia, Florida, Porto Rico, Alabama, Mississippi, and Arkansas. In none of these states was the disease at all abundant and no cases of any particular damage are reported.

Other diseases.

Smut, caused by Tilletia horrida Tak., was reported as present, locally in Georgia, where it was observed August 20.

Green smut, caused by Ustilagoidea virens (Oke.), was observed in traces, August 20, in Chatham County, Georgia.

Drought injury, caused considerable damage in the Arkansas rice growing region.

Flight, of a non-parasitic nature, was also reported as injuring 3% of the Arkansas rice crop. It was said to be general in the rice section. A similar trouble was said to be causing some damage in Mississippi and Porto Rico.

Leaf spot, caused by Cercospora oryzae Miy., was collected in the vicinity of San Juan by J. A. Stevenson.

SORGHUM

Head smut caused by Sphacelotheca reiliana (Kuhn) Cl.

Head smut was reported from Wisconsin, Minnesota, Kansas, Texas, and New Mexico. In all of these states it was of only slight importance, although in Texas it was said to be common and causing considerable loss.

Kernel smut caused by Sphacelotheca sorghi (Lk.) Cl.

Kernel smut was reported from Wisconsin, Nebraska, Kansas, Missouri, Arkansas, New Mexico, Colorado, and Washington. In these states it was apparently most abundant in Kansas, Nebraska, and Missouri. In the latter state 1% of the crop is reported damaged and it is thought that such varieties as Early and Red Amber are more susceptible than Amber, Kafir corn, and Milo Maize. In Kansas it was very common causing 5 to 8% loss. Some fields had as high as 40% smut. One specimen of Feterita, which in literature is said to be immune, was found with smut in Kansas.

Other diseases.

Blight, caused by Bacillus sorghi, Burr., was reported as common in Iowa, Missouri, Kansas, Arkansas, and New Mexico. It was also noted in Montana on August 1 and in Wisconsin.

Leaf spot, caused by Helminthosporium sp., was reported from the southwestern part of New York state on July 23.

Fusarium was reported on sorghum from Ratcliff, Arkansas, September 6.

Bud blight, cause not fully determined, was common in many Kansas fields according to L. E. Melchers.

Blight, cause undetermined, was reported on Sudan grass (Holcus sorghum var. sudanensis) in Texas, and a leaf spot and blight was found on the same host and on Johnson grass in Alabama.

BUCKWHEAT

Stem canker, cause undetermined, was found in Montana in a small field north of Columbus, destroying 2 to 3% of the plants.

Leaf spot, caused by Ramularia sp., was reported from Pennsylvania Huntingdon County, September 7.

Rhizoctonia sp., was reported from Washington.

DISEASES OF FORAGE CROPSA. LEGUMES.ALFALFA

Leaf spot caused by Pseudopeziza medicaginis (Lib.) Sacc.

Reports received from seventeen widely separated states indicate that leaf spot was general on the alfalfa crop but doing only a slight amount of damage. It appeared to be worst in Missouri where it was reported as very destructive over Cape Girardeau County. Tennessee reports 90% of the crop affected.

In Texas leaf spot often becomes so serious on susceptible varieties as to completely defoliate the plants. Of the varieties that have been under test there, the "Hairy Peruvian" has given the most satisfaction both because of its resistance to leaf spot and root knot and its hardiness to cool weather.

In general it was worst on the first crop.

Yellow leaf blotch caused by Pyrenopeziza medicaginis Fekl.

Reported from New York (found about Ithaca), Georgia (slight locally), Kansas (not common, but did damage in some local instances), Oklahoma (locally), Montana (common, but no damage), South Carolina (common), and Washington.

Anthraxnose caused by Colletotrichum trifolii Eain.

Reported from New York (only one report, June 1, Long Island), Delaware (as usual 1/2%), South Carolina (common, 10% crop injury), Georgia (local, only small loss), Mississippi (local, slight loss), Ohio, and Oklahoma (local, no loss).

Crown wart caused by Urophlyctis alfalfae (U. Lagerh.) Magn.

Reported from Nevada (in west, very slight damage), and Oregon, Jackson and Josephine Counties (1-5% crop injured but not serious).

Root rot caused by Sclerotinia trifoliorum Erik.

Reported from Kentucky (general, 10% loss), Ohio, Oregon (very severe locally), South Carolina (15% loss in some fields), Tennessee (10% crop injury), Virginia (unusually prevalent, more than 50% of crop injured). The disease first appeared early in the spring (February in Tennessee to March 19 in Virginia) and occurred on clovers as well as alfalfa (See clover

page 155). As will be noticed this is a serious disease in some localities. It is interesting to note that it is reported only from a group of states in the central eastern part of the United States and from the extreme northwest. A summary of the records of occurrence of the disease in recent years also seems to show a similar geographical restriction.

Downy mildew caused by Peronospora trifoliorum De Bary.

Reported from Mississippi (slight loss locally), Oregon (general, very slight loss), Montana (common, but no damage), and Washington (very slight loss).

Bacterial blight caused by Bacterium medicaginis Sack.

Reported from Minnesota (general), Nevada (general), Washington, and California. In the latter state it was found by F. R. Jones in the Sacramento Valley and his report is believed to be the first for this disease from the state. In none of the states is bacterial blight said to have caused any damage in 1918.

Root rot caused by Ozonium omnivorum Shear.

Reported only from Texas and Oklahoma (slight locally). In general the disease was less common than usual on account of the extremely dry season. In Texas it was prevalent, injuring about 2% of the crop. It was found on practically every farm and on most soils. According to Taubenhaus the disease usually appears on second year alfalfa, killing large areas in spots. It is especially severe on land that has not been sub-soiled. Generally when the disease becomes serious in Texas the field is planted with sorghum.

Root rot caused by Rhizoctonia sp.

Reported from Iowa, Kansas, and Washington. In Kansas and Iowa one case only was reported and the loss apparently was not very great. In Washington the disease was severe locally.

Leaf spot caused by Cercospora medicaginis E. & E.

Reported only from New Jersey and Texas. Unimportant in both states.

Wilt caused by Sclerotinia libertiana Fekl.

Reported from state of Washington (three localities, severe to moderate.)

Other diseases.

Rust, names of fungi not given but one of the Uredinales was reported from Alabama and Texas. In Alabama a very severe attack was observed in a field near Auburn by G. L. Peltier. This is the first time he has seen it in the state.

At College Station, Texas, the following varieties of alfalfa showed variation in susceptibility to rusts according to Taubenhaus and Malley: Varieties most subject - Oasis, Baltic, India, Turkestan. Varieties least subject - Hairy and Smooth Peruvian. Medium resistant types - two types of Spanish, two types of Kansas, and Grimm.

Phoma sp., was collected on alfalfa in Kansas, April 29. It was injuring about 1% of the crop in a few local instances.

Dodder, caused by Cuscuta spp., was reported from Arkansas (not common), Texas (unimportant), and Georgia (local early in season in south Georgia).

Fusarium sp., was reported by Frandsen as causing a root rot in Churchill County, Nevada. The damage was inappreciable.

Thielavia basicola was reported locally in Massachusetts. Earliest report was May 16.

Stagnospora carpathica (sp.?) was reported from New Jersey.

A white spot was reported from New Jersey (of little or no importance) and Washington, and a white leaf trouble similar to that described by Crabill (Phytopath. 6: 91-93, 1916) and of uncertain cause was reported from Montana where affected plants occurred in areas of considerable size in many fields. In one field practically every leaf of each plant was completely etiolated.

Alkali injury was reported from the Rio Grande Valley, Texas, and from Yakima County, Washington.

Winter injury. As a result of a special inquiry made in New York, 43 replies were received from 34 counties. Injury was reported from 17 counties. The average crop injury for the 34 counties was 11.5%. Since, however, the counties that reported the highest losses are not the largest producing counties it is probable that 11.5% as a general average for the state is too high.

CLOVER

Leaf spot caused by Pseudopeziza trifolii (Pers.) Eckl.

This leaf spot was reported from New York, Delaware, Ohio, West Virginia, and Kentucky. It did not seem to be of much importance, although locally in West Virginia and Kentucky it was said to have caused considerable trouble. In New York, where it was first reported July 2, it was noticed that red clover seemed to be more affected than alsike or white clovers.

Anthrachnose caused by Colletotrichum trifolii Pain.

Anthrachnose was reported from Maine, New York, Delaware, South Carolina, and Ohio. The disease seemed to be of slight importance only in all states. In Ohio it was thought to be more prevalent than usual, but in the other states apparently about the same.

Rust caused by Uromyces trifolii (Hed.) Lev.

Reported from Vermont, New York, New Jersey, Delaware, West Virginia, North Carolina, Georgia, Ohio, Minnesota and Arkansas. In all these states the disease seemed to be common but for the most part of only slight importance. In North Carolina and Georgia however, some few local outbreaks proved rather damaging to the crop.

Dodder caused by Cucuta spp.

Only reports were from Delaware (less prevalent) and Arkansas (generally distributed).

Other diseases.

A stem blackening and leaf blight, said to be caused by Bacillus lethyri M. & T., was reported by Manns from Delaware as being common and injuring about 1% of the crop.

Phyllachora trifolii was reported from Vermont as unusually common and injuring 75% of the crop at least around Burlington.

Sooty spot, caused by Polythrincium trifolii Kze., was reported from Delaware as injuring about 1%.

Gloeosporium caulivorum was reported by Sheldon from Monongalia and Preston Counties, West Virginia, where it seemed to be general and causing some damage, especially to blossoms.

Erysiphe polygoni was reported from Oregon ("probably general") and Washington.

Winter injury. A special inquiry regarding the extent of winter injury (1917-1918) was made in New York. Injury was reported from 14 counties scattered rather widely about the state. The average of 43 reports from 34 counties gave a crop injury of 3%.

Stemphyllium or Macrosporium was reported from Arkansas (general).

Rhizoctonia root rot was reported from Minnesota (trace) on alsike clover, and from Washington on sweet clover.

Sclerotinia libertiana was reported from New Jersey (occasional), Delaware (50% injury in at least one field) and Washington (on sweet clover).

Alkali injury was reported from Yakima County, Washington on alfalfa, clover and sweet clover.

WEEDS

Anthracoze, caused by Colletotrichum sp., was reported from Alabama.

Rust, caused by Uromyces pisi (Pers.) DeBary, was reported as occasionally occurring in Vermont.

Leaf spot, caused by Ascochyta sp., was reported once from the vicinity of New Haven, Connecticut, June 28.

B. GRASSES

MILLET (*Panicum* sp.)

Leaf spot, caused by *Piricularia grisea*, was found occurring locally in Minnesota.

Blight, apparently of bacterial cause, was noticed on three varieties of millet in Minnesota about August 17.

Downy mildew, caused by *Sclerospora graminicola* (Sacc.) Schr., was reported August 2 by L. H. Pammel from South Dakota. Pammel has reported this disease from Iowa frequently since 1909.

Smut, caused by *Ustilago crameri*, was reported on Italian millet from Nebraska.

TIMOTHY (*Phleum pratense*)

Rust, caused by *Puccinia phlei-pratensis* Eriks., was reported from New York (July 13), Pennsylvania (July 3), Ohio, Missouri and Montana.

Smut, caused by *Ustilago striaeformis* (West.) Niess., was collected in Iowa, Missouri and Washington.

Leaf blight, caused by *Scolecotrichum graminis* Fekl., was found severely damaging the leaves of plants in Montana.

A blade blight, bacterial in nature, was reported in Ohio.

A leaf blight, of undetermined cause, was found causing a great reduction in yield around Pomona, New York, June 27.

RED TOP (*Agrostis alba*)

Puccinia graminis was found on *Agrostis alba* at Oskaloosa, Iowa, June 19, forty feet from a hedge of infected barberries. None was found on the other supposedly susceptible grasses near by.

QUACK GRASS (*Agropyron repens*)

Stem rust, caused by *Puccinia graminis*, was reported on this host from Maine, New York, Illinois, Wisconsin, Minnesota and Nebraska. The following accounts of the relation of *Agropyron* to the cereals and the barberry from W. J. Morse from Maine and H. W. Anderson from Illinois are of interest.

Maine - "The relation between rust on barberry and on wheat and quack grass in a single location in Presque Isle was the subject of repeated observations by Dr. Folsom during the summer. Aecidiospores were being produced on the barberry about May 15 and in good amount on June 3. A wheat field across the road at the southeast was examined at various times

during the summer and no stem rust was observed till about harvest time when a small amount was found. This was spring wheat. Agropyron, between the road and the wheat and in the edge of the wheat field, became thoroughly infested with stem rust long before this. On July 12 stem rust could be found on the quack grass on the same side of the road as the barberry bushes for 180 feet to north and 105 feet to south."

Illinois (July 2) - "At Wheaton barberries were located on the edge of a garden and Agropyron repens about them was so heavily infected that the rust could be seen several yards and was in a dying condition. Along the edge of the garden A. repens extended for 50 yards to a lane at the other end of the garden. Across the lane was the wheat field. At the edge of this wheat field, next to the wheat, A. repens was heavily infected. There was absolutely no rust on the wheat. Across the road from the garden in another direction was an oat field. There was absolutely no infection on the oats, although A. repens along the roadside next to the field was heavily infected. This has been generally found to be the case in our observations in northern Illinois in the neighborhood of infected barberry. We have not yet found stem rust on wheat in northern Illinois, although I found it on rye in the neighborhood of Wheaton."

Ergot, caused by Claviceps purpurea, was collected in Minnesota and Nebraska.

Stem rust, caused by Puccinia graminis, was observed as very abundant on Agropyron tenerum near infected barberry bushes at Fort Collins, Colorado. Away from the barberries there was none on the grass and very little on wheat. What was reported as leaf rust was found on this host near Spooner, Wisconsin.

MEADOW GRASS (Poa sp.)

Puccinia poarum was reported from Minnesota.

Silver top of blue grass, caused by Sporotrichum sp., was observed in Iowa.

FESCUE GRASS (Festuca sp.)

Leaf spot, thought to be caused by Helminthosporium sp., was reported by Melhus from Iowa.

BROME GRASS (Bromus sp.)

Smut, caused by Ustilago bromivora, was reported by Heald and Dana from Washington.

Powdery mildew, caused by Erysiphe graminis, occurred at Pullman, Washington.

Leaf rust, cause not stated, was collected on B. ciliatus at Solon Springs, Wisconsin.

ITALIAN RYE GRASS (Lolium multiflorum)

Anthrachnose, caused by Colletotrichum sp., was observed in Washington state, near Tacoma.

BOTTLE BRUSH GRASS (Hystrix sp.)

Leaf spot, caused by Phyllachora graminis, was collected in Chisago County, Minnesota.

CRAB GRASS (Digitaria)

Leaf spot, caused by Piricularia grisea, was reported as common but unimportant in a number of places in east Texas.

BERMUDA GRASS (Cynodon sp.)

Puccinia cynodontis De Lac was collected several times in Porto Rico.

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THE PLANT DISEASE BULLETIN

Issued By

The Plant Disease Survey

SUPPLEMENT 5

Summary of Plant Diseases in the United States
in 1918 -- Diseases of Fiber Crops, Forest Trees,
Ornamental and Miscellaneous Plants

July 1, 1919

BUREAU OF PLANT INDUSTRY

UNITED STATES DEPARTMENT OF AGRICULTURE

SUMMARY OF PLANT DISEASES IN THE UNITED STATES IN 1918.

V. DISEASES OF FIBER CROPS, SUGAR CROPS, FOREST TREES, ORNAMENTAL AND MISCELLANEOUS PLANTS.

Prepared by

R. J. Haskell and G. H. Martin, Jr.

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DISEASES OF FIBER CROPS

COTTON

Wilt caused by *Fusarium vasinfectum* (Atk.)

Wilt was reported during 1918 in Virginia, Tennessee, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Texas, Oklahoma and Arkansas.

It was said to have been the worst cotton disease in Alabama, Mississippi and Arkansas.

In Virginia wilt was important, causing considerable injury in some fields. In Tennessee the damage was severe locally. In North Carolina it was local and moderately severe. In South Carolina it was very common below the Fall Line. In Georgia it was common, especially in the southern districts. Many fields in the Coastal Plain, belonging to the small tenant farmer, were a total failure. In Alabama it was general throughout the southern part of the state. In Mississippi it was widespread but present only in small amounts. In Louisiana it was very common and is spreading. In Texas it was somewhat scarce, but was serious where it occurred. In Oklahoma it was reported from Atoka, Bryan and Choctaw Counties where there were slight infections. In Arkansas it was general but severe only in the eastern and southern counties.

Favorable weather conditions were reported from Alabama, where it was dry and hot; while in Mississippi, Texas and Oklahoma the weather was reported to have been unfavorable for the development of the fungus.

Dates of first appearance of wilt:

1914 - June 20.....South Carolina	1917 - July.....Louisiana
July 23.....Mississippi	July.....Arkansas
1915 - June.....Mississippi	1918 - June.....Louisiana
June.....Louisiana	June 13...Mississippi
1916 - June.....South Carolina	July 20....Tennessee
June.....Louisiana	August 20..Georgia
July 12.....Georgia	October....Oklahoma
1917 - July.....Mississippi	

Wilt resistant varieties are said to be giving excellent results in South Carolina, Georgia and Arkansas.

Anthracnose caused by Glomerella gossypii (South.) Edg.

Anthracnose was found in 1918 in all the South Atlantic and Gulf states except Oklahoma.

It was common in Tennessee, South Carolina, Georgia, Florida, Mississippi, Texas and Arkansas. The disease was locally severe in Virginia, South Carolina and Mississippi; and was generally very serious in Georgia. There was less in Alabama than in 1917.

The loss in Virginia averaged about 1%, although it was one of the most important cotton diseases in the state. In Tennessee the crop injury averaged 5% with an estimated loss of 10,000 bales. In South Carolina the loss was around 1%, the average crop injury amounting to about 10%. In Georgia the estimated loss for the state was about 8%. In Florida the disease destroyed as high as 6% to 7% of the crop in some instances. In Alabama a field count was made by Mr. Armstrong on the Station Farm which was as follows:

Three rows of Kings Triumph.

Number of stalks counted.....	102
Number of stalks with one or more infected bolls.....	26
Percent of stalks with affected bolls.....	25.4
Estimate of damage.....	5-8%

In Mississippi the damage varied from 1 or 2% to 15 and 20%. In Louisiana there was a fairly large crop injury but the loss was slight, about 1-2%. In Texas about 2% of the crop was injured. In Arkansas there was only a trace of injury.

Unfavorable weather conditions were said to have prevailed in Tennessee, South Carolina, Florida (cold spring), Alabama; and the first part of the season in Georgia and Louisiana, but later on rains allowed rapid development of anthracnose. In Georgia the weather was rather favorable. Drought was apparently instrumental in keeping down the disease in Texas.

Anthracnose was worst in South Carolina and Mississippi on low ground's and situations where the cotton was subject to overflow during wet weather or when rank growth existed. There was often an association of the disease with *Cercospora* and insects in Georgia. It was especially bad on seedlings in Florida during 1918. The severe outbreaks were thought to indicate that the disease was introduced by means of infected seed.

Where "gin run" seed was used to any extent in Mississippi the disease appeared to be worse.

Dates when anthracnose was first observed by collaborators in 1914 to 1918 inclusive are as follows:-

<u>1914</u>		<u>1917</u>	
July.....	Mississippi	July.....	Louisiana
August 10.....	South Carolina	July.....	Arkansas
August 12.....	Texas	July 15.....	Tennessee
<u>1915</u>		August 20.....	North Carolina
July.....	Louisiana	September.....	Oklahoma
July 19.....	Georgia	<u>1918</u>	
August.....	Mississippi	June.....	Florida
September 20.....	Texas	June 4.....	Georgia
September 30.....	Oklahoma	July.....	Louisiana
<u>1916</u>		July 24.....	Mississippi
May 8.....	Georgia	August 15.....	Tennessee
August.....	Louisiana	September 9.....	Virginia
August 1.....	South Carolina		
September 30.....	Virginia		

The Half and Half variety was severely injured in North Carolina where infection on this variety ran as high as 50%; while on other varieties it was usually less than 5%, and on special selections less than 1%. All varieties were reported to be susceptible in Georgia.

Seed selection as a means of control has been used in South Carolina but its use there is not a general practice.

Angular leaf spot and boll rot caused by Bacterium malvacearum E.F.S.

This disease was widely distributed throughout the cotton growing states. It was reported found in Virginia, Tennessee, North Carolina, South Carolina, Georgia, Alabama, Mississippi, Louisiana, Texas, Oklahoma and Arkansas.

It was generally prevalent in Tennessee, North Carolina, South Carolina, Georgia, Alabama, Mississippi, Oklahoma and Arkansas, and it was reported to have been common in Virginia, Florida and Texas.

The loss, judging from the reports received, was apparently less than for 1917. Little damage was done in Virginia, Mississippi and Arkansas. In Tennessee there was a 10% crop injury, but the loss was only about 1%. In Georgia there was an occasional 50% defoliation while the loss only amounted to about 1.5%. In Alabama it was severe the early part of the season. This was especially true at Uniontown (Perry County) where a field of variety tests showed uniform infection of about 95% of the plants, fully 20% of the leaves on these plants showed spots. In Louisiana there was considerable injury. In Oklahoma infection ranged from a trace to 100%, although it was not so bad as in 1916 and 1917.

In North Carolina the leaves were the principal part affected. Premature shedding was occasioned in some cases in South Carolina. It was often associated with red spider and plant lice in Georgia.

Unfavorable weather conditions were reported from Tennessee, South Carolina, Alabama, Texas, Oklahoma and Arkansas. In these states the season was hot and dry. There was considerable drought in Texas, which assisted in keeping the disease down. In Louisiana there was some rain which helped to spread the causal bacteria. It was first noticed in May in Alabama, Georgia and Oklahoma.

According to reports received from South Carolina, Georgia and Oklahoma, there was no varietal resistance noted in the respective states.

Perfect control is reported by the use of the method of seed treatment worked out at Clemson College.

Malnutrition (Non-parasitic)

Malnutrition troubles supposedly due to the lack of the proper proportions of potash in the soil, were found from Tennessee down through the South Atlantic Coast and Gulf states, excepting Florida and including Arkansas. From all reports it had a greater distribution than in 1917.

More loss was apparently caused in 1918 to the cotton crop by this trouble than any other disease, and from reports seemed to have caused an equal or perhaps a greater amount than in 1917. Large losses occurred in North Carolina, South Carolina, Georgia, Alabama, Mississippi and Louisiana. In South Carolina fields in the Coastal Plain section were completely defoliated. Louisiana suffered more from the trouble than at any time during the past eleven years.

Various factors seemingly affected the prevalence and degree of severity of the disease. Thus in South Carolina it was reported to have been more prevalent on sandy soils than on soils where the clay subsoil lay near the surface. In Arkansas the "tuck shot" lands and river bottoms afford favorable conditions to bring about severe damage to the crop. Although malnutrition in Louisiana was severe on poor ground it also occurred on fairly rich ground and on some that analyzed rich in potash.

Dry weather and cultural conditions were the indirect sources in Alabama of severe outbreaks of malnutrition since there seemed to be enough available potash in the soil.

The susceptibility of plants suffering from malnutrition to Cercospora gossypina, Alternaria sp. and other diseases, complicates the estimating of the true loss produced by the trouble itself.

Root-knot caused by Heterodera radicum (Greef.) Mull.

Root-knot was reported in 1918 from North Carolina, South Carolina, Georgia, Florida, Alabama, Louisiana, Texas and Arkansas.

In Georgia it was general in the southern part of the state. In Louisiana there was very little. In Texas it was scarce. In Arkansas it was found in many sections, but not at all serious. As usual it occurred mostly on the sandy soils and was often associated with wilt.

In South Carolina the loss was about 2%, and in individual cases the crop injury ran as high as 100%.

The weather was said to have been favorable in South Carolina, but unfavorable in Texas on account of the drought.

Dixie cotton was apparently quite susceptible to root-knot as the disease was especially prevalent where this variety had been used to evade wilt.

Other diseases.

Root rot, caused by Ozonium omnivorum Shear was reported in 1918 from Texas, Oklahoma (first report) and Arkansas.

In Texas there was apparently less than the usual amounts. The disease was found in Waco County on the same spots where it had occurred during the past years. In Oklahoma it was found in three counties in the southeastern section of the state, causing some loss. In Arkansas it appeared in the southwestern corner of the state.

Drought conditions which existed in Texas assisted apparently in preventing the usual development of root rot. In Oklahoma the weather was unfavorable due to the dry, hot weather conditions during the cotton season.

Earliest appearance, October, in Oklahoma.

Leaf spot, caused by Cercospora gossypina, was found in North Carolina, South Carolina, Texas and Oklahoma. It was local and unimportant except in North Carolina where in certain localities of the Coastal Plain and in part of the Southern Piedmont district it caused some damage.

Alternaria leaf spot appeared during 1918 in sufficient amounts to be of economic importance in Louisiana, Oklahoma and Arkansas. It occurred as a secondary infection, often following angular leaf spot.

Shedding of the squares and bolls was apparently the worst and most general cotton trouble in Mississippi during 1918. The same trouble was prevalent in 1913 throughout Arkansas, where it has occurred for a number of years but only occasionally occurring in amounts to cause any appreciable loss. The squares and bolls fall and often remain hanging to the plant by a shred of the epidermal tissue.

"Black seed", a name given by the planters for a run down condition, was noticed in a few fields in 1918 in South Carolina. The seed produces practically no lint and plants growing from such seed are usually small and stunted.

FLAX

Wilt caused by Fusarium lini Folley

Wilt was reported from Minnesota, North Dakota and Montana. In Minnesota the disease was general and probably more abundant than in 1917. About 2% of the crop was reported injured. In Montana the disease was said to be prevalent about as usual, affecting less than 1% of the crop.

The following report from H. L. Folley, dated September 1, 1918, shows his views on the subject: "Fusarium lini and possibly allied species is the chief limiting factor in flax crop production in the Northwest. Ordinary weather conditions are such that a sufficient crop of seed would be produced for the supply of the nation by the states of Montana, North Dakota, South Dakota and Minnesota. Fusarium lini occupies new areas of land, reducing them to utter unproductivity so far as flax is concerned unless the most rigid tillage and crop rotation is introduced and a resistant form of seed is used. In dry years it works in the ground and makes blighting of the entire crop a certainty. In wet years it brings about root rot and makes absolute elimination of all those areas, the soil of which is generally infested. The organism is wind blown, water washed, seed carried, and when once introduced in fertile soils is very persistent."

Rust caused by Melampsora lini D.C.

Occurred in Minnesota, North Dakota, Montana and probably other flax

states. In Minnesota and Montana the disease was said to be of no especial importance but in North Dakota it was said to be rather more common than usual. With regard to the occurrence of rust in that state Folley says:

"*Melampsora* is very destructive, particularly under rather constant flax culture. It accumulates in the old straw and in regions where flax is rather constantly grown it becomes accentuated and at times very destructive. In some respects it seems to be more destructive under dry soil and weather conditions than under a moist environment. The foliage and stems do not seem to be able to withstand the rust in hot, dry weather with the result that the plants are speedily defoliated and lose the seed forming power."

Canker caused by *Colletotrichum lini*. Bolley.

Flax canker, which was reported from both North Dakota and Montana, was said to be the worst flax disease in the latter state. From 2 to 3% of the plants were killed and the average percentage of crop injury for the state was placed at 10%. According to Folley this disease attacks the stems, often causing the plants to break over. The organism is seed borne, water washed and soil carried and is similar in its action upon its host to many other species of *Colletotrichum*.

DISEASES OF SUGAR CROPS

SUGAR CANE

Red rot, caused by *Colletotrichum falcatum* Went., was reported from Porto Rico, Florida, Louisiana and Texas. In Texas it was said to have followed attacks of sugar cane borer.

Root rot, caused by *Marasmius plicatus* Wak., was reported from Georgia, Porto Rico and Louisiana. In Georgia it was said to be general, producing at least 50% infection and resulting in about a 5% loss in certain individual fields. Estimated loss for state was not over 5%. The disease occasionally penetrates the stalks resulting in a dry pithy rot. No syrup is produced in the dry pithy stalks.

Pineapple disease, caused by *Thielaviopsis paradoxa* De Seynes & Hohn., was reported from Porto Rico (much less common than usual).

Rind disease, caused by *Melanconium sacchari*, was reported from Louisiana (no loss).

Mottling, cause unknown, was reported from Porto Rico where it has spread practically to all parts of the Island, and continues to be epidemic in nature, occasioning heavy losses.

Leaf spot, caused by *Leptosphaeria sacchari* Van B. de H., was reported from Porto Rico (common).

Macrosporium sp. was reported from Georgia.

Sclerotium rolfsii was reported from Georgia.

Winter injury occurred in Arkansas 1917-1918 (most of the crop was frozen out).

Yellow stripe was reported from Porto Rico.

Red spot of sheath, caused by *Cercospora vaginae* Kruger, was reported

from Porto Rico (very common everywhere. Rayada or striped variety very susceptible).

Cladosporium sp. was found near Cairo, Georgia.

Fusarium sp. was found in Georgia.

Leaf spot, caused by Helminthosporium sacchari Butler, was reported from Porto Rico ("Very common in portions of the island. Causes losses during periods of dry weather especially. Certain varieties much more susceptible than others").

Helminthosporium sp. was reported from Georgia.

Root-knot, caused by Heterodera sp., was reported from Florida (caused material damage to crop in one locality).

SUGAR BEET

Leaf spot caused by Cercospora beticola Sacc.

Leaf spot was reported on sugar beets from Connecticut, Ohio, Michigan, Wisconsin, Minnesota, Kansas, Colorado and Utah, and it doubtless occurred to some extent at least in all of the other beet producing states. In general it did not cause any special damage, but in Colorado it brought about some loss. It is estimated that 10-20% of the crop was injured in that state and that about .2% loss was sustained. About Fort Collins it was epidemic, being the worst in five years.

Curly top (Cause undetermined).

Judging from reports received, curly top was very rare in 1918 and caused only a very little damage. It was reported from New Mexico, Nevada, Utah and Washington, and was said not to have been observed in Michigan, Kansas or Montana. Curly top has never been reported with certainty from any of the states east of the Missouri River and as a rule it does not seem to be particularly destructive over a period of more than one season in any given locality. The disease has been reported in the past to the Survey from the following states only: Nebraska, Kansas, Texas, New Mexico, Arizona, Colorado, Utah, Nevada, Idaho, Washington, Oregon and California.

Nematode caused by Heterodera schachtii.

Reports of the occurrence of this nematode were received only from Colorado in 1918, although it is known to have been present also in Utah and California.

In Colorado, Robbins says that the area of infestation appears now to be restricted to less than 80 acres of beets, and that a most rigid quarantine is being enforced by the field agents of the sugar beet companies. Great care is taken to prevent the spread of infested soil to new fields and rotation is practiced. The losses of a few individual growers have been large during the past year, but the losses to the sugar companies were light.

In 1917 a special search for this nematode was made in some of the western states, particularly in California. Suspicious reports were followed up in New Mexico and Arizona with negative results. The infested areas of

any size in California were definitely located and similar work was started in other states. The accompanying map, modeled after one prepared by D. G. Milbrath who did most of the survey work, shows the range of the nematode in 1917. It also represents the distribution of the pest in 1918, as no new reports were received.

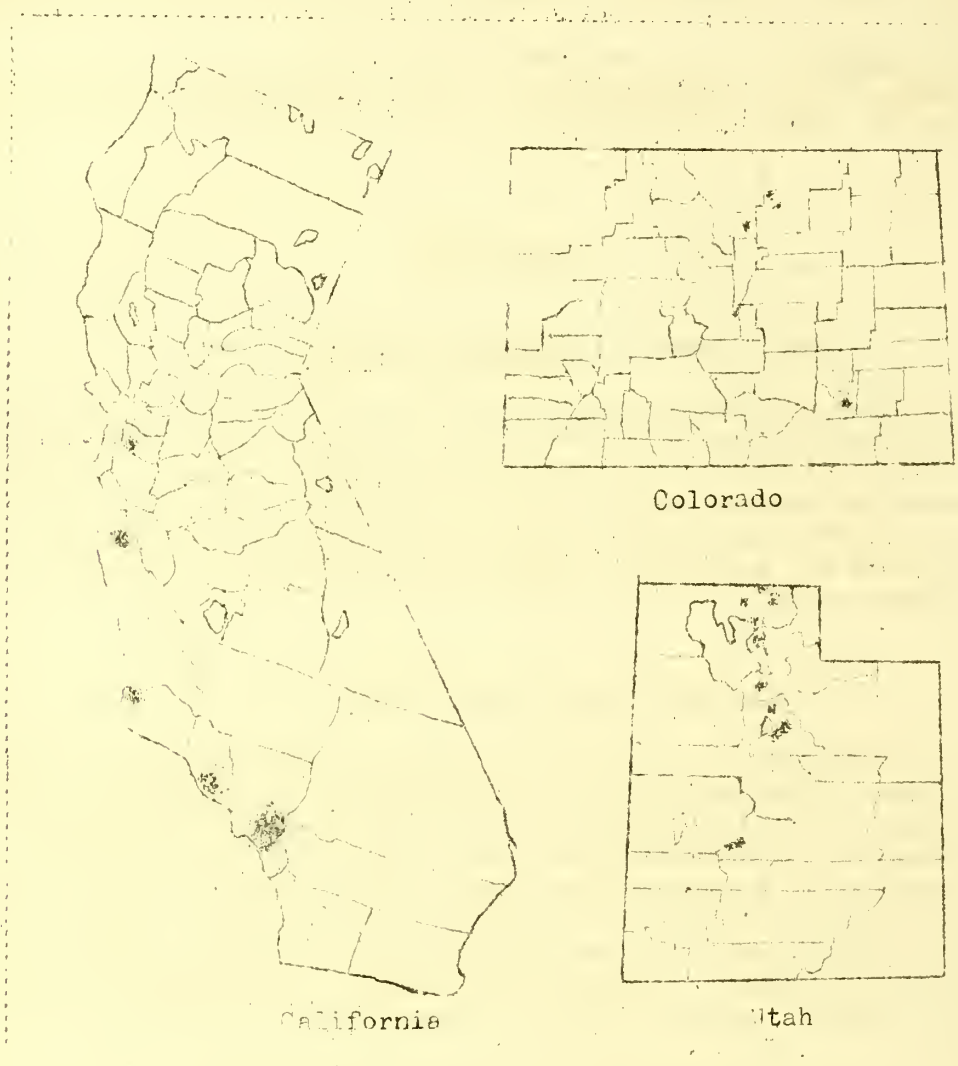


Figure 8. Geographical distribution of Heterodera schachtii as determined by D. G. Milbrath, 1917.

Regarding the occurrence of the nematode in California, Milbrath writes the following: "Heterodera schachtii is distributed generally in the counties of Orange, Ventura and Los Angeles, and is also found with considerable frequency in Monterey, Alameda, San Barbara and San Bernardino Counties. The new beet areas in Joaquin County appear free from infestation.

"The chief means by which the nematode is spread in California seem to be floods, cattle farm implements and men. The frequent floods of some of the rivers have been the means of carrying the nematodes to beet areas the entire length of their courses. The herds of cattle which are permitted to feed on beet tops after the roots are harvested are undoubtedly an important agent of distribution.

"Growers and sugar companies alike are aware of the existence and menacing nature of the sugar beet nematode."

The following table shows the losses as estimated by Milbrath for the six California counties that he surveyed.

Table XAV. Estimate of money loss from sugar beet nematode in California, 1917.

County	No. fields examined	No. acres examined	Percentage loss (range)	Loss per acre	Total loss
Monterey	59	4104	----	\$11.90	\$49,017
Alameda	10	891	0-15	5.60	5,033
Orange	65	10,211	4-20	7.66	79,269
Los Angeles	44	5637	0-10	3.00	16,545
San Joaquin	9	3355	0	0	0
Ventura	37	2006	2-30	4.90	9,925

Total acres of sugar beets in state 195,000.

Average loss per acre \$6.10

Estimated total loss of crop in state \$1,189,500

The Union Sugar Company reported the following concerning the California situation in 1917: "Disease serious in district south of Los Angeles and around Chino, Oxnard, Betteravia and Spreckels. The Oxnard, Chino and Los Angeles district had an increase of infested soil of probably 10-15%; the Betteravia district a decrease of 25-50% on company controlled areas; and Spreckels a slight increase. A two years rotation with beans is proving very successful in the region around Betteravia.

In Utah the disease was under observation in 1917 by E. G. Titus and J. W. Jones, both of the Sugar Plant Office.

Mr. Titus reported, "Serious in Lehi factory, Ogden, Salt Lake, Willard and Cache Valley districts. Disease has increased annually at the rate of 10-20%. It is not so common on very heavy soils and rather rare on alkaline land. Few farmers are employing any method of control. Alfalfa (3 years) sown with grain crops (never oats) in fall or spring followed by potatoes, corn, melons or onions 1-2 years, then beets, has been used to good advantage. The estimated average loss to the grower is \$300 and to the sugar companies in sugar at \$7.25 over \$1,000,000."

Mr. Jones reported the following: "Worst in Utah and Weber Counties, also bad in Salt Lake, Davis, Fox Elder and Cache Counties. It is most serious in the sandy loam soils. In Utah County on 1200 acres it is estimated there was a 30% loss. The sugar companies lost in about the same proportion as the growers: There are probably about 10,000 acres infested."

From Colorado, S. E. Nuckols wrote as follows on October 15, 1917, "The disease was present in Sterling, Brush and Fort Morgan areas, northern Colorado and Arkansas Valley. Only a small percent of the total acres planted were infested. This is the first year it has been seen in northern Colorado. So far the estimated annual loss to the grower and sugar companies is not known, but it is believed to be small."

Phoma rot and leaf spot caused by Phoma betae Frank.

Rotting of beets from Phoma was reported by collaborators from Ohio, Wisconsin, Montana and Colorado. In all cases the loss was said to be slight, causing less than 1% reduction in the crop. The fungus was also identified on beets sent into the Sugar Plant Office at Washington from the additional states of Michigan, Utah and Idaho.

Root rot caused by Rhizoctonia sp.

Reported to the Survey from Ohio, Michigan, Wisconsin, Colorado, Montana, Washington and California. In general it was of comparatively slight importance. A report of a large amount of seedling injury (damping off) in the Yakima Valley, Washington, was received by F. D. Heald and although he did not see specimens still he thinks it was probably due to Rhizoctonia.

Other diseases.

Scab, caused by Actinomyces scabies (Thaxter) Gussow, was reported from Connecticut on sugar beets near New Haven.

Sclerotium rolfsii was isolated at Washington from tips of infected tap roots of beets grown at Artesia, California.

Phyllosticta betae was found by Miss Rumbold to be causing a leaf spot on beets from Salt Lake County, Utah.

Fusarium spp. were isolated by Miss Rumbold from decaying beets sent in from Michigan, Utah, Idaho, California and Ontario.

Alternaria was collected on beet leaves at various points in Utah.

Dodder, caused by Ouscuta sp., was reported from New Mexico.

DISEASES OF FOREST TREES

JUNEPERRY (Amelanchier sp.)

Black knot, caused by Flowrightia morlota (Schw.) Sacc., was reported on A. canadensis from Minnesota.

Brown rot, caused by Sclerotinia cinerea (Bon.) Schrot., was reported from Ohio.

ARBOR VITAE (Thuja sp.)

Winter injury which had not been reported for several years from Maine was observed there during 1918. According to W. J. Morse it always appears there when winter injury occurs on the apples.

Elight (non parasitic) was reported from Washington.

ASH (*Fraxinus* sp.)

Rust, caused by Puccinia fraxinata (Lk.) Arthur, was reported from Connecticut, Ohio, Minnesota and Nebraska. In Connecticut it was less during 1918 than usual. In the other three states it was said to be scattered.

Leaf spot, caused by Cercospora fraxinites E. & E., was reported from Texas.

Leaf spot, caused by Phyllosticta viridis El. & Kel., occurred locally in Minnesota. Unimportant.

Canker, caused by Physalospora cydoniae Arnaud = (Sphaeropsis malorum Pk.), was reported as general on ash in Massachusetts during 1918.

Witches broom, caused by Exoascus cerasi (Fckl.) Sad., was reported from Ohio.

BIG TREE (*Sequoia Washingtoniana*)

Botrytis douglassi was reported from Ohio.

BIRCH (*Betula* sp.)

Canker, caused by Sphaeropsis conglobata, was reported from Ohio.

Galls, which were thought to have been caused by Dothidia sp., were found on branches near Bar Harbor, Maine.

BOX ELDER (*Acer negundo*)

Canker, caused by Nectria cinnabarina, was reported from Ohio.

Anthracnose, caused by Gloeosporium sp., was reported from Minnesota. It was local with only a trace of injury.

BUTTERNUT (*Juglans cinerea*).

Leaf spot, caused by Marssonina juglandis (Lib.) P. Mag., was reported from New York. Many trees were defoliated as the disease was general and rather severe.

Dead branches, supposedly caused by Melanconium oblongum, were reported found on butternut in Connecticut.

CAMPHOR TREE (*Cinnamomum camphora*)

Anthracnose, caused by Gloeosporium camperea, was reported from Texas. Unimportant.

Canker, caused by Diplodia sp., was reported from Texas. Restricted and unimportant.

CATALPA (*Catalpa* sp.)

Leaf spot, caused by Phyllosticta catalpae, was reported from New Jersey (Very abundant), Pennsylvania (local) and Ohio (scattered).

Root rot, caused by Ozonium omnivorum Shear, was present in Texas.

Heart rot, caused by Polystictus versicolor, was reported from Ohio.

Chlorosis of Japanese Catalpa, due to the richness of the soil in lime, caused some damage to the trees in Texas.

Sap rot, caused by Stereum versicolor, was present in Ohio.

Wilt of the leaves, caused by Sclerotinia sp., was reported from Ohio.

A wilt (cause undetermined) was reported from Ohio.

CHESTNUT (*Castanea* sp.)

Blight caused by Endothia parasitica (Murr.)

(Prepared by Roy G. Pierce, Office Forest Pathology, Mar. 19, 1919.)

Chestnut blight extends from Maine southwest through New York, Pennsylvania and West Virginia to Bedford County, Virginia. A general infection occurs in Massachusetts, New Hampshire, Connecticut, Rhode Island, New York, New Jersey, Pennsylvania, Maryland, West Virginia and Virginia. Spot infections occur in Guilford County, North Carolina, on native timber; at Darlington, South Carolina, on planted stock; Lake County, Ohio, on nursery stock and native timber; in Cuyahoga County, Ohio; in Seneca and Livingston Counties, New York; and at Lewiston, Maine. The first infection in West Virginia west of the Alleghenies has been reported from Rowlesburg, Preston County, and at Morgantown, Monongalia County. The disease has spread by means of natural agents through the native chestnut forests from Maine to Virginia, but shipments of nursery stock have been responsible in the past for the spread of the blight to points in other states, viz:- in Agaassiz, British Columbia; Tehama County, California; Gage and Lancaster Counties, Nebraska; Page County, Iowa; Benton, Marion, Tippecanoe and Wells Counties, Indiana; Ingham County, Michigan; and Darlington County, South Carolina. In all but the last named state, the blight has been eradicated as far as known.

Chestnut blight has caused more damage to forest trees in America than any other known disease. Massachusetts reports 80% of the chestnut infected. New Jersey reports blight "abundant". Delaware, in 1917, reported percent of crop injured "almost total". It is estimated that there is approximately 100% infection in the vicinity of New York and Philadelphia. Proceeding westward in New York and Pennsylvania, the blight greatly decreases until it is absent in the western part of both states.

The loss occasioned by chestnut blight consists in the killing of large and small trees, making necessary immediate utilization of timber before decay and insect infestation has set in. This cutting of large tracts of chestnut timber has resulted in glutting the market. The loss to mature timber has not been so great as that to immature chestnut stands and to young sprout growth, which over large areas, has been practically total. Destruction of commercial chestnut orchards has resulted in loss of the nut crop. The destruction of chestnut lawn and street trees has resulted in an incalculable loss.

An estimate by Dr. Haven Metcalf in 1911 of a loss of \$25,000,000, caused by the blight up to that time, was considered by him in 1914 as being much too conservative. This loss to standing chestnut timber, chestnut reproduction and orchard and shade trees may today approximate \$50,000,000, if it does not exceed it.

No means have been discovered of effectively and cheaply preventing the infection of chestnut trees or of curing them after they are once infected. State quarantines on nursery stock may slow down the spread of the blight by preventing long distance jumps to uninfested regions. Already California and Illinois have such quarantines.

American chestnut is very susceptible. European chestnut and American chinquapin (*Castanea pumila*) are susceptible. Japanese chestnut is resistant. Robert T. Morris of Stamford, Connecticut, reports Chinese chestnuts and northern Japanese and Korean varieties decidedly resistant. Lately in the vicinity of New York several groups of American chestnut have been found which are reported attacked by the disease but showing resistance to the blight.

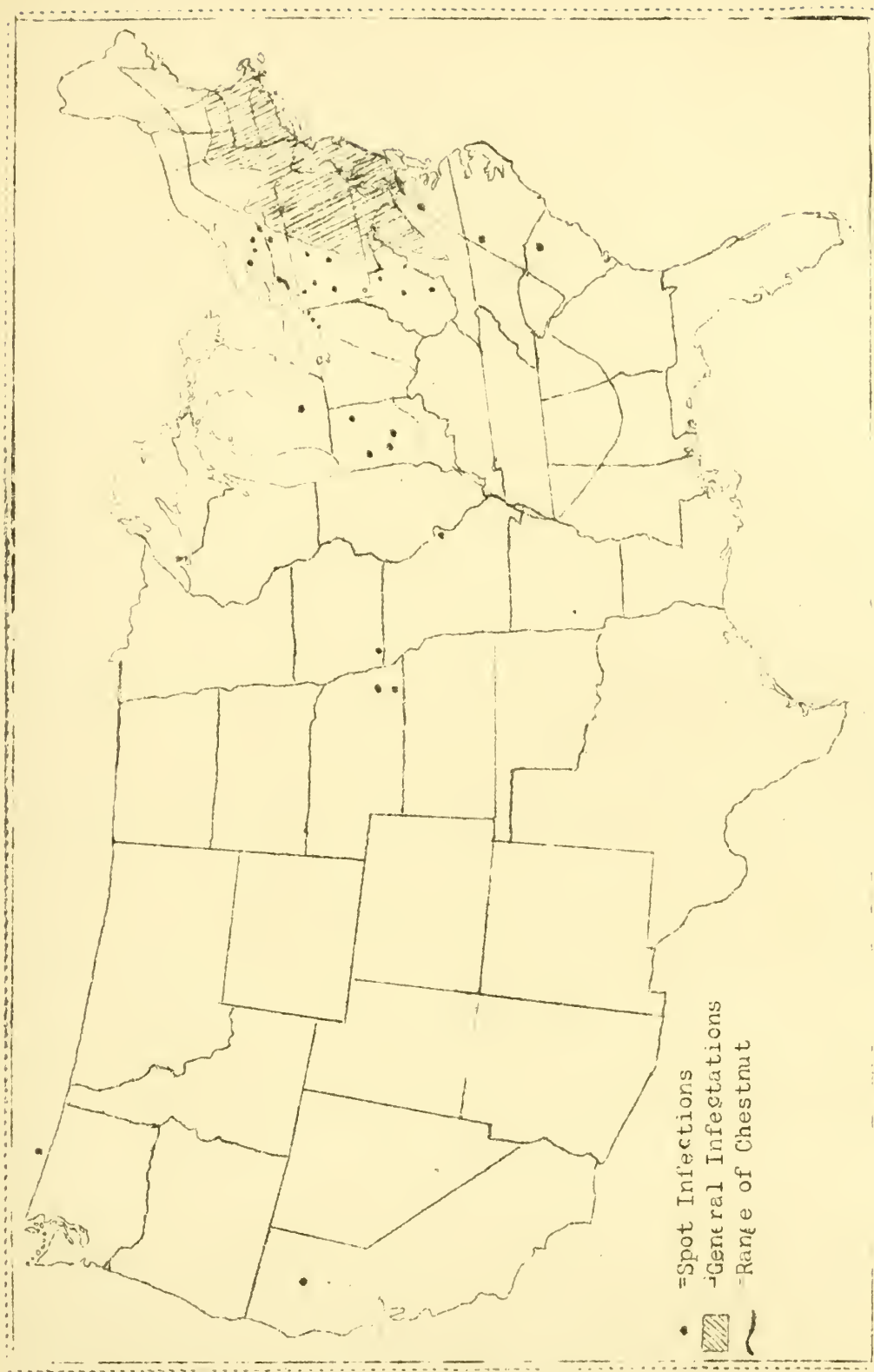


Fig. 10. Geographical Distribution of Chestnut
Blight in Years Prior to 1918.

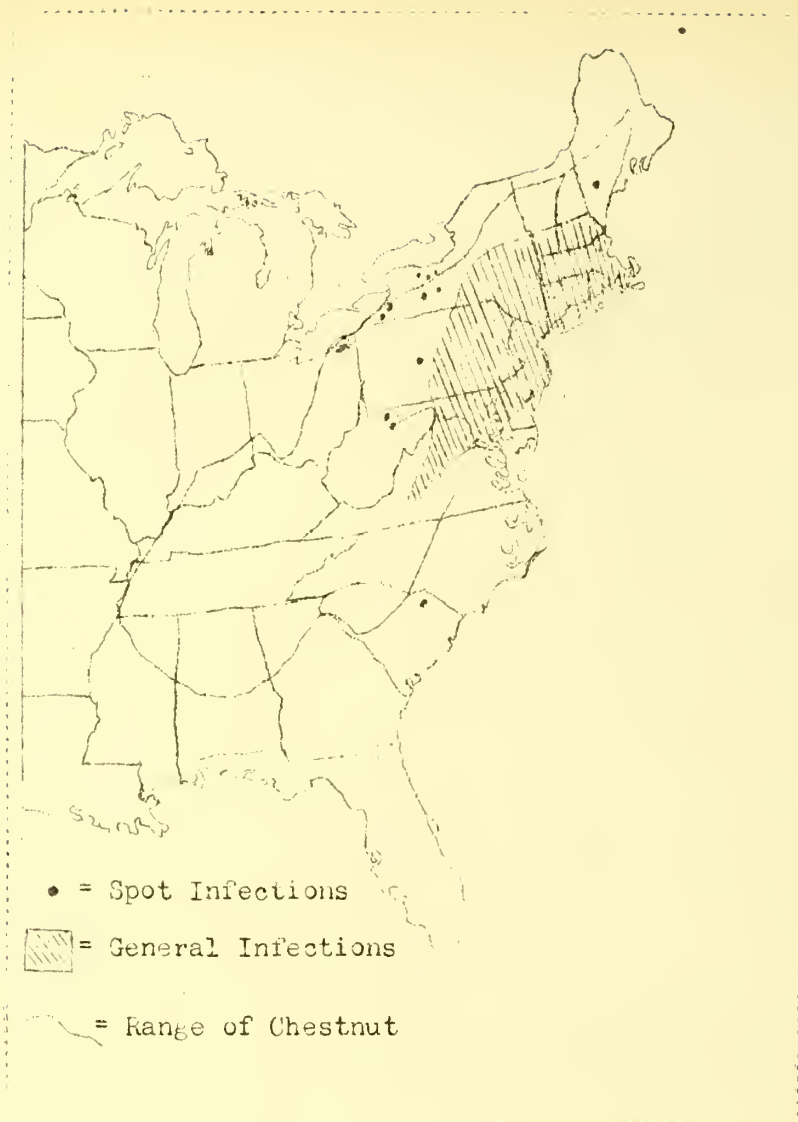


Fig. 9. Geographical distribution of chestnut blight in 1918.

ELDER (Sambucus)

Nectria, caused by Nectria sp., was common in Vermont on old plants. Rust, caused by Aecidium sambuci, was reported from Ohio.

ELM (Ulmus sp.)

Leaf spot, caused by Dothidella ulmea, was reported from Vermont, New York, and Ohio. It was very common in Vermont and rather common in New York. In Vermont the injury was about 50%, but due to lateness of appearance, little loss resulted.

Certain trees were noticed in New York to be very susceptible while immediately adjoining trees would be immune.

Multiple buds, caused by Fusarium sp., was reported from Ohio.

Branch canker, caused by Nectria cinnabarina (Tode) Fr., was reported from Ohio.

Root rot, caused by Ozonium omnivorum Shear, was common in Texas. Estimated loss about 1%.

Injury from frost was reported from Washington.

Winter injury was reported from New York.

Leaf scorch, due to weather conditions, was more frequent than usual in Connecticut.

HICKORY (*Hicoria* sp.)

Anthrachnose, caused by Gloeosporium caryae, was reported from Ohio.

HORSE CHESTNUT (*Aesculus hippocastanum*)

Leaf blotch, caused by Guignardia aesculi (Peck) Stewart, was reported from Massachusetts, New York, New Jersey and Ohio.

Frost injury occurred in Washington.

JUNIPER (*Juniperus* sp.)

Winter injury was more than usually severe in Connecticut during the winter of 1917-1918.

LARCH (*Larix* sp.)

Valsa abietis was reported from Ohio.

LOCUST (*Robinia* sp.)

Blight, cause uncertain, was reported on black locust from Washington. Dodder (*Cuscuta* sp.) was reported from Washington.

MAGNOLIA (*Magnolia* sp.)

Lichen injury to the leaves was reported from South Carolina and Texas.

Root rot, caused by Ozonium omnivorum Shear, was common in Texas on the umbrella tree. Twenty percent of trees affected locally.

MAPLE (*Acer* sp.)

Anthrachnose, caused by Gloeosporium sp., was reported from Massachusetts, Ohio, Minnesota and Kansas. Moderate damage in Massachusetts. Only a trace in Minnesota.

Leaf spot, caused by Phyllosticta sp., was reported from New Jersey, West Virginia, Ohio and Minnesota.

Black specked leaf spot, caused by Rhytisma punctatum, was reported from West Virginia and Minnesota.

Tar leaf spot, caused by Rhytisma acerinum Fr., was reported from New York, New Jersey, West Virginia, Ohio and Minnesota.

Sun scald was commonly reported from Connecticut, New York, New Jersey, Pennsylvania and Ohio. In Pennsylvania the foliage on the south sides of the trees was scorched the worst.

Tip burn occurred in Pennsylvania at State College after about 48 hours of high wind with a temperature of about 87 to 90° F.

Frost injury was reported from Washington.

Leaf spot, cause unknown, was quite common in Vermont, 5 to 10% injury.

MOUNTAIN ASH (*Sorbus* sp.)

Canker, caused by *Cytospora leucostroma*, was reported by H. M. Jernison from Montana. It was found in considerable amounts on trees planted for ornamental purposes at Bozeman. Over 1% of the trees along the parking of a single street were destroyed by this disease.

Two cases of winter injury were reported from Whitman County, Washington.

MULBERRY (*Morus* sp.)

Bacterial blight, caused by *Bacillus mori* B. & L., was reported from New York and Texas.

Blight, cause unknown, was reported from Ohio.

Texas root rot, caused by *Ozonium omnivorum* Shear, was reported from Texas where it was common, with an estimated loss of about 4%.

OAK (*Quercus* sp.)

Twig blight, caused by *Botryodiplodia ravenelli*, was reported from Ohio.

Anthracnose, caused by *Gnomonia veneta* (Sacc. & Speg.) Kleb., was reported from Massachusetts, Ohio and Minnesota.

Nectria cinnabarina (Tode) Fr., was reported from Alabama.

PALM (*Palmae*)

Leaf spot of Corozo palm, caused by *Cercospora acromiae* Stevenson, was reported from Porto Rico.

Smut, caused by *Graphiola phoenesis* (Mong.) Poit., was reported from Texas.

PINE (*Pinus* sp.)

Blister rust caused by *Cronartium ribicola*, Fischer.

(Prepared by Roy G. Pierce, Office of Forest Pathology, March 19, 1919.)
In 1918 blister rust of white pine was found in all of the New England states, New York, New Jersey, Pennsylvania, Michigan, Wisconsin, Minnesota, Ontario and Quebec. The rust was general in New England; in New York, in the Adirondacks and east of the Hudson River as far south as Columbia County; in southern Ontario; in northwestern Wisconsin; and in Minnesota in the Valley of the St. Croix. It occurred on both pine and Ribes in all the above mentioned states and provinces except Pennsylvania and Michigan, and in these latter two only on pine.

In New York only limited scouting was carried on in 1918 outside the generally invaded area. Ribes infections were found in Franklin, St. Lawrence, Jefferson, Monroe, Niagara and Chautauqua County, with pine also infected in Monroe County. In the nurseries of the state, a large measure of control has been attained, for in 1918, the number of nurseries with rust was but two, as compared with eight in 1917, and sixteen in 1916. In the Geneva district, where there are large Ribes-growing nurseries and fruiting plantations, and where the disease has been present since 1906, no blister rust was found in 1918, indicating that the disease is beginning to be controlled.

One or more control demonstration areas have been established in Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut and New York where practical methods of control are being worked out for the benefit of pine owners.

In Connecticut the spraying of black currants gave almost complete control, but at such a high cost that it is not practical.

In New Jersey, the rust was reported from three counties: Camden on pines, Monmouth on pine and black currants, and Morris on pines. In former years the rust has been found in Bergen, Essex, Mercer and Passaic Counties. The number of yearly occurrences is being reduced by intensive inspection, removal of diseased Ribes leaves and quarantine of infested nurseries.

In Pennsylvania the disease was reported from Berks, Montgomery and Philadelphia Counties, all on white pine. In former years, it had been reported from Cambria, Chester, Huntingdon, Lancaster and Monroe Counties on pine.

In Michigan the rust was reported from Oakland County on pine.

In Wisconsin infections were found in ten counties: Barron, Burnette and Polk Counties on pine and Ribes; Clark, Dunn, Marathon, Pepin, Rusk, Shawano and Washburn Counties on Ribes.

In Minnesota infections were found in Chisago, Pine and Washington Counties on pine and Ribes, and in Olmstead and Ramsey on pine. In 1916 and 1917 blister rust was reported from Anoka, Hennepin, Isanti, Lyon, Kanabec and Steele Counties, and the infected pines and Ribes were removed. The non-appearance of the rust in 1918 in these six counties show that a beginning has been made in the control of this disease.

Prior to 1918 the blister rust had been reported from Virginia, Ohio, Indiana and South Dakota on planted white pines, and from Iowa on planted limber pine (*Pinus flexilis*). Destruction of the diseased lots in these states has resulted in the elimination of the rust as far as known.

Though the western half of the United States has been scouted for the blister rust for the past two seasons, especially in the western white pine and sugar pine districts, no sign of the disease has yet been discovered.

In 1918 the warm weather early in April caused the formation of aecial blisters on pine earlier than usual, as well as early formation of uredinia on Ribes. Notes from Minnesota give the following data:

Minnesota:

First Open Aecial Blisters: May 24, 1916.
May 8, 1917.
April 19, 1918.

First Uredinia: June 20, 1916.
June 12, 1917.
May 18, 1918.

First Telia: July 22, 1916.
June 12, 1917.
* July 8, 1918, at Grantsburg,
Wisconsin, across the St. Croix
River from Minnesota.

* This is the earliest date reported in 1918 for the Lake States, but telia were probably present in June.

While the damage that has at present been caused by this disease to native or planted white pine in this country is very small, considering the total value of the mature stand of these pines, yet the potential danger from this plant disease to the white pine reproduction and to the millions of young planted pine is very great, unless energetic measures be taken to

combat it. Infections on pine in limited areas have been as high as ninety-five percent. Many of the smaller trees have been killed outright, while larger trees have been killed in the tops or completely girdled.

The Federal Government, the New England States, New York, Pennsylvania, Wisconsin and Minnesota have made appropriations to study and combat this disease.

Other diseases.

Winter injury was reported from Maine and Connecticut.

Canker, caused by Cenangium abietis, was reported from Ohio.

Leaf scorch, cause unknown, was reported from New York. Varietal resistance was noticed in the white and Austrian pine.

Rust of Jack pine, caused by Cronartium cerebrum (Pk.) Hedge. & Long, was reported from Maine.

Rust of Scotch pine, caused by Cronartium comptoniae Arth., was reported from Ohio.

POPLAR (*Populus* sp.)

Canker, caused by Cytospora chrysosperma, was reported from Nebraska, Montana and New Mexico. In Montana large shade trees were seriously damaged as well as the young trees which were transplanted.

Frost injury was reported from Washington.

Canker, caused by Dothichiza populea, was reported from New Jersey (frequent).

Leaf spot, caused by Septoria populi, was reported from Minnesota (trace).

Anthracnose, caused by Marssonie sp., was reported from Connecticut, New Jersey and West Virginia (no so severe as usual).

Rust, caused by Melamosora sp., was reported from Nebraska.

SPRUCE (*Picea* sp.)

Rust, caused by Melampsoropsis ledicola (Peck.) Arth., was reported from Washington.

Rust, caused by Coleosporium solidiganis (Schw.) Thum., was reported from Minnesota.

SUMACH (*Rhus* sp.)

Canker, caused by Physalospora cydoniae Arn., was reported from Ohio.

SYCAMORE (*Platanus occidentalis*)

Anthracnose, caused by Gnomonia veneta, was reported from New Jersey (abundant), Texas, Oklahoma and Ohio.

TULIP TREE (*Liriodendron tulipifera*)

Mildew, cause not reported, was found in Ohio.

Tar spot, caused by Rhytisma lirioidendri, was reported from Ohio.

Canker, caused by Verticillium sp., was reported from Ohio.

WALNUT, BLACK (*Juglans nigra*)

Anthracnose, caused by Marssonie juglandis, was very destructive to young second growth in West Virginia.

Bacterial blight, caused by Bacterium juglandis Pierce, was reported from Oregon. General over state.

WILLOW (Salix sp.)

Rust, caused by Melampsora saliciscoprae, was reported from Minnesota. Melampsora sp., was reported from Washington.

Tar spot, caused by Ehytisma solicinum, was reported from Ohio and Minnesota.

- Leaf spot, caused by Septoria sp., was reported from Minnesota.
- Leaf spot, caused by Pseudopeziza salicis, was reported from Minnesota.
- Mildew, caused by Uncinula salicis, was reported from Ohio.

YEW (Taxus)

Winter injury was the cause of the death or injury of many trees in Connecticut.

DISEASES OF ORNAMENTAL PLANTS

AMPELOPSIS (Ampelopsis sp.)

Dieback, caused by Cladosporium sp., was reported from New Jersey where it was said to be less abundant than usual.

Leaf spot, caused by Guignardia bidwellii (E.) V. & R., was reported from New Jersey where it was abundant on lower leaves and a serious pest on the young plants.

ARROW HEAD (Sagittaria)

Leaf spot, caused by Cercospora sagittariae, was reported from Texas.

ASTER (Aster sp.)

Orange rust, caused by Coleosporium solidaginis (Schw.) Thum., was very common in Vermont in 1913, appearing about October 10. Weather conditions were favorable for its growth.

Fusarium wilt, caused by Fusarium sp., was reported from Urbana, Illinois, where 60% of the plants in one bed and 20% in another bed had died. One doubtful case was reported from Maine.

BARBERRY (Berberis sp.)

Bacterial spot was reported from Nebraska on B. vulgaris.

Blight, caused by Verticillium sp., was reported from Ohio on Japanese barberry.

BEGONIA (Begonia sp.)

A bacterial disease of the begonia was reported from Ohio.

BOX (Buxus sp.)

Winter injury was quite general in Connecticut during 1918.

CANNA (*Canna* sp.)

Rust, caused by Puccinia cannae, was reported from San Domingo. It destroys the leaves.

CARNATION (*Dianthus caryophyllus*)

Rust, caused by Uromyces caryophyllinus (Sch.) Wint., was reported from New Jersey, Ohio, Oklahoma, Oregon and Washington.

Wilt, caused by Fusarium sp., was reported from Pennsylvania and Ohio. Careless methods in propagation and soil treatment are responsible for the loss to a large extent in Pennsylvania.

Root rot, caused by Corticium vagum B. & C., was common in New Jersey during 1918.

Root knot, caused by Heterodera radiculicola (Greef.) Muller, was present in slight amounts in Texas.

Stem rot, caused by Potrytis sp., was found in Ohio.

CENTURY PLANT (*Agava americana*)

Blight, caused by Stagonospora gigantea, was common in Texas. Unimportant.

CHRYSANTHEMUM (*Chrysanthemum hortorum*)

Powdery mildew was reported from Ohio.

Leaf spot, caused by Septoria chrysanthemi, was reported from Oklahoma. It occurred locally in Payne County.

COCKLEBUR (*Xanthium* sp.)

Texas root rot, caused by Ozonium omnivorum Shear, was common in Texas on this host as well as on many others.

Rust, caused by Puccinia xanthi, was reported from Texas.

CYCLAMEN (*Cyclamen* sp.)

Root knot, caused by Heterodera radiculicola (Greef.) Muller, was found in Nebraska. The nematode seriously damaged cyclamens in an Omaha greenhouse.

DANDELION (*Taraxacum*)

Fasciation, cause unknown, was reported from Washington.

DAHLIA (*Dahlia* sp.)

Powdery mildew, caused by Erysiphe cichoracearum D. C., was common in West Virginia.

DRACENEA (*Dracaena* sp.)

Leaf spot, caused by Phyllosticta maculicola Hals., was common in Porto Rico.

ENONYMUS (*Enonymus* sp.)

Crown gall, caused by Bacterium tumefaciens Sm. & Town., was reported

from Connecticut.

Leaf spot, caused by Exosporium concentricum, was common in Texas.

Root rot, caused by Ozonium omnivorum, was reported from Texas.

FEVERFEW (Chrysanthemum parthenium)

Rhizoctonia, caused by Rhizoctonia sp., was reported from Washington.

FLOWERING CRAB (Pyrus pulcherrima)

Rust, caused by Gymnosporangium juniperi-virginianae, appeared locally in Kansas.

GERANIUM (Geranium sp.)

Bacteriosis, caused by Bacterium erodii, was reported from Ohio and Washington.

Rhizoctonia, caused by Rhizoctonia sp., was reported from Washington.

GLADIOLUS (Gladiolus sp.)

Hard rot, caused by Septoria gladioli, was general in New York. The crop injury ranged from 20-50%. No varietal resistance was noted. Planting of selected healthy corms in clean soil is successful.

GOLDEN GLOW (Rudbeckia lacinata)

Powdery mildew, caused by Erysiphe cichoracearum D. C., was present in West Virginia in small amounts.

GOLDEN ROD (Solidago sp.)

Orange rust, caused by Coleosporium solidaginis, was very abundant in Vermont.

HOLLYHOCK (Althea rosea)

Rust, caused by Puccinia malvacearum Mont., was reported from Maine, Vermont, Massachusetts, New York, New Jersey, West Virginia, Ohio, Washington and Oregon. The disease seemed to be general in all the states reporting.

Leaf blight, caused by Cercospora althaeina, was reported from Connecticut.

Anthracnose, caused by Cercospora malvarum, was reported from Ohio.

Leaf spot, caused by Phyllosticta althaeina, was reported from Ohio.

Root rot, caused by Ozonium omnivorum Shear, was reported from Texas, where it was prevalent in nurseries.

HYDRANGEA (Hydrangea sp.)

Leaf spot, caused by Septoria hydrangea, was reported from Ohio.

IRIS (Iris sp.)

Leaf spot, caused by Scolecotrichum iridis F. & R., was reported from Minnesota.

Leaf spot, caused by Heterosporium gracile (Wal.) Sacc., was reported from Ohio and Washington.

Soft rot, caused by Bacillus carotovorus, was reported from Minnesota. It was more general than usual, the injury running as high as 75%, average about 5%.

IVY - BOSTON - (Psedera tricuspidata)

Leaf spot, caused by Phyllosticta ampeloidis E. & M., was very destructive locally in West Virginia.

KERRIA JAPONICA

Twig and leaf disease, caused by Coccomyces kerriae Stew., was reported from Kentucky. It was very prevalent in a nursery at Louisville where it killed all the yellow kerrias.

LARKSPUR (Delphinium sp.)

Bacterial spot, caused by Bacillus delphini, was reported from Connecticut. Not common.

Root rot, thought to have been caused by Rhizoctonia sp., was reported from New York. Nearly all the plants of one grower were injured.

LAUREL (Kalmia sp.)

Winter injury in Connecticut was severe during 1917-1918.

LILAC (Syringa vulgaris)

Mildew, caused by Microsphaera alni (Wal.) Salm., was reported from Vermont, New York, New Jersey, West Virginia and Ohio.

Leaf spot, caused by Phyllosticta halstedii E. & E., was present in New Jersey.

Injury from drought was reported from Washington.

MALLOW (Malva sp.)

Rust, caused by Puccinia malvacearum, was very common in Vermont.

MIGNONETTE (Reseda odorata)

Root rot, probably caused by Fusarium sp., was reported twice from greenhouses near New York City. The injury was large in both cases.

PEONY (Paeonia sp.)

Leaf blight, caused by Botrytis sp., was reported from New York, Ohio and Minnesota.

Root and stem rot, caused presumably by a Fusarium sp., was reported from Missouri. Has occurred in a nursery for past three years, being quite injurious.

Leaf blotch, caused by Cladosporium paeoniae, was reported from Minnesota.

Stem rot, caused by Sclerotinia libertiana, was reported from Minnesota. Mosaic was reported affecting the peony in Ohio.

PHLOX (Phlox sp.)

Powdery mildew, caused by Erysiphe cichoracearum, was reported from

Connecticut, New Jersey and Ohio.

PIGWEEED (Amaranthus retroflexus)

White rust, caused by Albugo bliti (Bw.) Kze., was reported from Nebraska.

PRIVET (Ligustrum sp.)

Root rot, caused by Ozonium omnivorum Shear, was reported from Texas.

Anthracoese, caused by Gloeosporium cingulatum Atk., was reported from Texas and Ohio.

Leaf spot, caused by Exosporium concentricum, was reported from Texas.

Winter injury occurred in Connecticut and Ohio. In Connecticut it was general throughout the state, killing or injuring many plants.

ROSE (Rosa sp.)

Mildew, caused by Sphaerotheca pannosa (Wallr.) Lev., was reported from Massachusetts, New York, New Jersey, West Virginia, Mississippi, Louisiana, Porto Rico, Oklahoma, Texas, Arkansas, Ohio, Minnesota, Missouri, Washington and Oregon. The rambler varieties, especially the crimson ramblers, were said to be most susceptible in Massachusetts, New York and Oklahoma. Sulphur-lead dusting gave good results in New York.

Black spot, caused by Diplocarpon rosae Wolf = Actinonema rosae (Lib.) Fr., was reported as common in New York, New Jersey, West Virginia, Louisiana, Texas, Arkansas, Ohio, Minnesota, Missouri, Washington and Oregon.

Crown gall, caused by Bacterium tumefaciens Sm. & Town., was reported from New Jersey and Ohio.

Anthracoese, caused by Gloeosporium rosae, was reported from New Jersey and Ohio.

Rust, caused by Phragmidium sp., was reported from Maine, New York, Arkansas, Minnesota and Nebraska.

Root rot, caused by Ozonium omnivorum Shear, was reported from Texas. It was common. The loss estimated about 20%.

Cane blight, caused by Leptosphaeria coniothyrium (Fckl.) Sacc., was reported from New Jersey and Ohio.

Bud rot, caused by Botrytis cinerea, was reported from Ohio.

Leaf spot, caused by Phyllosticta rosicola, was reported from New Jersey.

Leaf spot, caused by Septoria rosae Desm., was reported from Porto Rico.

Leaf spot, caused by Cercospora rosicola, was reported from Porto Rico and Santo Domingo.

Rhizoctonia was reported affecting roses in Texas.

Gall, cause undetermined, was reported from Porto Rico.

Winter injury, due to the low temperature (22° with high wind), was common in New York. Many varieties were killed, even those that were usually hardy. The ramblers were especially badly hurt.

Chlorosis was reported from Nebraska.

SALVIA (Salvia sp.)

Cladosporium aphidis was reported from Ohio.

SNAPDRAGON (Antirrhinum majus)

Rust, caused by Puccinia antirrhinum, was reported from Massachusetts, Ohio, Minnesota, Nebraska, Washington and Oregon.

Root knot, caused by Heterodera radicicola (Greef.) Muller, was reported from Nebraska. It destroyed all the plants in an Omaha greenhouse.

SPIRAEA (*Spiraea* sp.)

Root rot, caused by Ozonium omnivorum Shear, was reported from Texas.

SUNFLOWER (*Helianthus annuus*)

Rust, caused by Puccinia helianthi, was reported from Vermont, West Virginia and Nebraska.

Powdery mildew, cause not given, was reported from Oregon.

SWEET PEA (*Lathyrus odoratus*)

Powdery mildew, caused by Erysiphe polygoni D. C., was reported from Washington.

Wilt, caused by Fusarium sp., was reported from New York and Connecticut.

TAMARIX (*Tamarix* sp.)

Root rot, caused by Ozonium omnivorum Shear, was reported from Texas.

TULIP (*Tulipa* sp.)

White rot, caused by Sclerotinia fuckeliana, was reported from Ohio.

VERBENA (*Verbena* sp.)

Powdery mildew, caused by Erysiphe cichoracearum D. C., was reported from Texas.

VEICH (*Vicia* sp.)

Leaf spot, caused by Ascochyta viciae Lib., was reported from Connecticut.

Rust, caused by Uromyces pisi (Pers.) de B., was reported from Vermont.

YUCCA (*Yucca* sp.)

Leaf spot, caused by an undetermined fungus, was reported from Washington.

VIOLET (*Viola* sp.)

Rust, caused by Puccinia violae (Soph.) Kleb., was reported from Minnesota.

ZINNIA (*Zinnia* sp.)

Powdery mildew, caused by Erysiphe cichoracearum D. C., was reported from West Virginia.

Leaf spot, caused by Cercospora tricinota H. & W., was reported from Porto Rico.

DISEASES OF MISCELLANEOUS PLANTS

BROOM CORN (*Panicum* sp.)

Stagonospora curvula was reported from Nebraska.

BUCKTHORN (*Rhamus* sp.)

The aecial stage of crown rust of oats (Puccinia coronata) was said to be common on this host in Vermont and Minnesota.

CASSAVA (*Manihot* sp.)

Leaf spot, caused by Cercospora henningsii Allesch, was reported by Stevenson from Porto Rico and Santo Domingo. In Porto Rico it was common but the damage was negligible. In Santo Domingo it was the only disease present and of no economic importance.

CHAYOTE (*Sechium edule*)

Leaf spot, caused by Cercospora sachii Stev., was reported from Porto Rico. It was very common and serious.

CACAO (*Theobroma cacao*)

Wood rot, due to careless pruning, was very prevalent in Santo Domingo according to Stevenson.

Die-back was one of the most serious troubles noted on Santo Domingo plantations. This seemed to be due to close planting and poor cultural conditions rather than to any specific fungus.

COCOANUT (*Cocus* sp.)

Bud rot, caused by Bacillus coli, was reported from Santo Domingo. It was very destructive, destroying whole groves. As yet it has not reached Porto Rico in a virulent form. In Cuba the groves have been devastated, causing a loss of millions of trees.

COFFEE (*Coffea arabica*)

Leaf spot, caused by Cercospora coffeicola, was reported from Santo Domingo.

CROTON (Oil Plant)

Rust, caused by Eubakia crotonis, was reported as common in Texas. Injury unimportant.

DATE (*Phoenix dactylifera*)

Leaf spot, caused by Exosporium palmivorum Sacc., was prevalent in Texas on greenhouse plants.

Leaf smut, caused by Graphiola phoenicis (Morig.) Poit., was reported from Porto Rico and Santo Domingo.

GINSENG (*Panax quinquefolium*)

Leaf spot (cause undetermined) was reported from Washington.

HOP (*Humulus lupulus*)

Mildew, caused by *Sphaerotheca humuli*, was present in New York wherever hops were grown. About 100% of the crop was affected. Dusting with sulphur gave excellent results as usual.

Winter injury, caused by low temperatures, produced in New York severe losses in hop fields of Schoharie County.

MUSTARD - CHINESE (*Brassica* sp.)

Leaf spot, caused by *Cercospora bloxani* Berk. and Br., was reported Porto Rico.

PAPAYA (*Carica papaya*)

Leaf spot, caused by *Pucciniopsis caricae* Earle, was common in Porto Rico.

RHUBARB (*Rheum* sp.)

Root rot, probably bacterial, was found in Missouri.

Anthracnose, caused by *Colletotrichum* sp., was reported from Pennsylvania.

Rhizoctonia, caused by *Rhizoctonia* sp., was reported from Washington.

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THE PLANT DISEASE BULLETIN

Issued By

The Plant Disease Survey

SUPPLEMENT 6

Crop Losses from Plant Diseases, -- 1918

August 1, 1919.

BUREAU OF PLANT INDUSTRY

UNITED STATES DEPARTMENT OF AGRICULTURE

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Washington, D. C.

July 1, 1919.

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CROP LOSSES FROM PLANT DISEASES, 1918.

Many estimates of losses from plant diseases has been made at various times in the past but as a rule these estimates have been limited to a single disease or crop and are often scattered in numerous publications. Last year the Plant Disease Survey made an attempt to bring together in one place all disease loss estimates of some of the more important crops for the year 1917. The results were published in mimeographed form in the Plant Disease Bulletin (Pl. Dis. Bul., 2 : 1-18, 1918.) This past season much the same sort of work has been done and the results are set forth in the following tables.

METHOD OF OBTAINING ESTIMATES

The sources of information on which these estimates are based may be listed as follows:-

1. Collaborators of the Plant Disease Survey. One set of estimates was usually handed in from each state and this often represented the combined judgement of the plant pathologists at the experiment station or college. A list of collaborators is given in this bulletin.
2. Records of the 1918 cereal disease survey conducted by the Office of Cereal Investigations, U. S. Department of Agriculture.
3. Crop disease specialists in the Bureau of Plant Industry.
4. Reports and records of the Plant Disease Survey.

In the winter of 1918-1919 collaborators were provided with blank forms on which to report the losses to wheat, barley, rye, oats, corn, potatoes, bean, tomato, onion, cotton, sweet potato, apple and peach. The results obtained were summarized and a set of preliminary estimates were prepared. In these initial estimates the percentage figures were arranged in parallel columns along with those from other sources. The preliminary estimates were resubmitted to collaborators and also sent to pathologists in the Bureau of Plant Industry for additions and corrections. The following tables have been prepared taking into account the revisions that were made.

SYMBOLS

Certain symbols occur frequently in the place of figures on the following pages. Their significance is as follows:

- = no data.
- t = trace. It indicates that the loss is less than 1% but data are not available for estimates beyond that. In some instances, such as the cereal smuts, where many detailed counts are available and where state estimates have been made to a fraction of a percent, t usually signifies a small fraction of 1% (less than .1% in many cases).
- + = loss occurred but amount inestimable. This is used (a) where a trace is given as the percentage loss; (b) when no production figures are given but when the percentages show some loss; (c) to indicate an excess. It is used in connection with most of the totals to signify that the actual loss is probably greater than that shown; and (d) in the case of leaf rusts of cereals where percentages of affected leaf area are available but where intelligent estimates of reduction in yield are impossible at this time.

METHODS OF CALCULATING LOSSES

In these tabulations the losses are expressed in percentages of the total crop and in amount of reduction in yield (bushels, bales, etc.). No attempt has been made to estimate money loss.

The reductions in yield were calculated by considering the production for the year as 100% minus the percentage of the crop lost by disease. Thus, Pennsylvania produced 24,718,000 bushels of wheat, the loss from bunt was estimated at .5%; therefore, 24,718,000 bushels was 99.5% of a crop. One percent equals 248,422 bushels, .5% equals 124,211 (124,000) bushels.

The average estimated percentage of loss for each disease for the United States was obtained by dividing the total reduction due to the disease by the sum of the given production plus the total reduction. Thus in the case of bunt of wheat the reduction in yield for the United States totaled 19,063,000 bushels, which is found to be approximately 2% of 950,271,000 bushels (917, 100,000 + 33,171,000, the production + the reduction).

Estimated probable reduction in yield of wheat due to bunt (Tilletia laevis and T. tritici), loose smut (Ustilago tritici), scab (Fusarium sp.), stem rust (Puccinia graminis) and leaf rust (Puccinia triticea), 1918.

State	Production 1918 Bushels :000 omitted	Estimated Reduction in yield due to diseases						190
		Bunt % :000 omitted	Loose Smut % :000 omitted	Scab % :000 omitted	Stem Rust % :000 omitted	Leaf Rust % :000 omitted		
Me.	506	.5	.7	.4	-	-	-	
N. H.		t	.7	.3	-	-	-	
Vt.	396	t	.8	.2	t	t	+	
Mass.		.5	.4	t	t	t	+	
R. I.		t	.5	-	-	-	-	
Conn.		t	1.	t	-	-	-	
N. Y.	7,840	.5	.5	t	-	-	-	
N. J.	1,700	.7	1.4	t	-	-	-	
Penn.	24,718	.5	1.7	3.	.3	74	t	
Del.	1,729						+	
Md.	11,346	.3	4.	1.			+	
Va.	15,600	2.8	3.	1.5	t	+	+	
W. Va.	4,942	1.	2.	1.5	t	+	+	
N. C.	7,105	.7	2.7	t	t	+	+	
S. C.	2,255	.6	1.8	t	t	+	+	
Ga.	3,631	1.4	4.	t	t	+	+	
Ohio	43,547	.9	1.9	2.	.1	44	+	
Ind.	49,427	2.7	2.4	1.	t	+	+	
Ill.	60,991	1.9	1.5	1.	t	+	+	
Mich.	10,716	3.6	.6	t	.5	54	+	
Wisc.	9,837	.9	t	.3	.5	49	-	
Minn.	79,710	3.5	.5	.3	.1	80	-	
Iowa	19,650	1.1	.4	1.5	t	+	-	
Mo.	53,154	1.6	1.1	t	t	+	-	
N. D.	101,010	1.6	.5	t	-	-	-	
S. D.	71,305	2.1	1.5	.4	.7	503	-	

RYE

Estimated reduction in yield of rye due to stem smut (Urocystis
occulta) and ergot (Claviceps purpurea), 1918.

State	Production 1918 Bushels :000 omitted	Estimated reduction in yield due to diseases					
		Smut			Ergot		
		Bushels		Bushels		Bushels	
		%	:000 omitted:	%	:000 omitted:	%	:000 omitted:
Vermont	21	0	0	0	0	0	0
Massachusetts	80	t	+	t	+	+	+
Rhode Island	-	t	+	0	0	0	0
Connecticut	242	t	+	t	+	+	+
New York	1,848	t	+	t	+	+	+
New Jersey	1,350	0	0	.3	4		
Pennsylvania	4,250	t	+	.5	21		
Delaware	14	-	-	-	-	-	-
Maryland	450	t	+	-	-	-	-
Virginia	1,200	t	+	-	-	-	-
West Virginia	301	0	0	-	-	-	-
North Carolina	480	t	+	-	-	-	-
South Carolina	202	t	+	0	0	0	0
Georgia	176	0	0	t	+	+	+
Ohio	1,887	1.3	25	-	-	-	-
Indiana	6,765	-	-	.2	14		
Illinois	3,800	1.0	38	.2	8		
Michigan	6,750	t	+	t	+	+	+
Wisconsin	7,674	0.5	39	.21	16		
Minnesota	8,700	0.8	70	.13	11		
Iowa	1,026	0.2	2	.23	2		
Missouri	476	.3	1	t	+	+	+
North Dakota	20,422	-	-	.01	2		
South Dakota	10,350	-	-	-	-	-	-
Nebraska	5,005	0	0	t	+	+	+
Kansas	2,431	0	0	t	+	+	+
Kentucky	884	0	0	t	+	+	+
Tennessee	300	0	0	-	-	-	-
Alabama	44	t	+	-	-	-	-
Texas	22	.5	+	-	-	-	-
Oklahoma	88	1.5	1	-	-	-	-
Arkansas	21	0	0	.2	+	+	+
Montana	240	0	0	-	-	-	-
Wyoming	450	0	0	-	-	-	-
Colorado	324	0	0	-	-	-	-
Utah	208	0	0	-	-	-	-
Idaho	60	0	0	-	-	-	-
Washington	70	0	0	-	-	-	-
Oregon	492	-	-	-	-	-	-

United States : 89,103 : .19 : 175+ : .09* : 78+ :

Total reduction due to smut and ergot 28 254+

*The estimates for ergot in 1917 were probably too high. The figures for that year represent better the % affected heads rather than actual reduction in yield of grain.

BARLEY

Estimated reduction in yield of barley due to stripe (Helminthosporium gramineum), loose smut (Ustilago nuda), and covered smut (Ustilago hordei), 1918.

State	Production:		Estimated reduction in yield due to diseases							
	1918									
	Bushels		Stripe		Loose Smut		Covered Smut			
	:000 omitted:	%	:000 omitted:	%	:000 omitted:	%	:000 omitted:	%	:000 omitted:	%
Maine	300	:	:	.8	2	.9	3	:	:	:
New Hampshire	32	1.1	+	1.2	+	.8	+	:	:	:
Vermont	496	.7	4	1.	5	.6	3	:	:	:
Massachusetts	:	t	+	.5	+	.6	+	:	:	:
Rhode Island	:	:	:	.8	+	1.	+	:	:	:
Connecticut	:	2.5	+	2.	+	.2	+	:	:	:
New York	3,938	.5	20	2.	80	.8	32	:	:	:
New Jersey	:	:	:	1.	+	.5	+	:	:	:
Pennsylvania	420	:	:	4.	18	t	+	:	:	:
Maryland	186	:	:	5.	10	3.	6	:	:	:
Virginia	324	:	:	1.	3	:	:	:	:	:
West Virginia	:	:	:	2.6	+	:	:	:	:	:
South Carolina	:	:	:	2.	+	t	+	:	:	:
Georgia	:	:	:	2.	+	5.	+	:	:	:
Ohio	3,150	2.	64	2.7	87	2.6	84	:	:	:
Indiana	1,665	3.1	53	5.7	101	t	+	:	:	:
Illinois	9,000	:	:	3.	278	2.	184	:	:	:
Michigan	8,332	2.5	214	.6	50	3.	258	:	:	:
Wisconsin	25,383	4.6	1,224	.8	205	1.2	303	:	:	:
Minnesota	43,400	1.5	661	1.	438	1.	438	:	:	:
Iowa	11,340	4.4	522	.3	34	.5	57	:	:	:
Missouri	250	t	+	2.	5	1.	3	:	:	:
North Dakota	37,281	4.	1,553	1.	377	2.5	956	:	:	:
South Dakota	41,300	9.8	4,487	.6	249	2.1	886	:	:	:
Nebraska	5,660	t	+	2.	116	2.	116	:	:	:
Kansas	6,040	t	+	.5	30	.5	30	:	:	:
Kentucky	196	:	:	:	:	:	:	:	:	:
Tennessee	184	:	:	5.	10	:	:	:	:	:
Alabama	:	:	:	5.	+	t	+	:	:	:
Mississippi	:	:	:	7.	+	4.	+	:	:	:
Louisiana	:	:	:	t	+	t	+	:	:	:
Texas	170	:	:	3.	5	5.5	10	:	:	:
Oklahoma	136	:	:	8.	12	5.7	8	:	:	:
Arkansas	:	t	+	:	:	:	:	:	:	:
Montana	1,914	t	+	1.	19	.5	10	:	:	:
Wyoming	1,110	t	+	:	:	.8	9	:	:	:
Colorado	4,928	:	:	.8	40	.2	99	:	:	:

New Mexico	:	392	:	:	:	:	:	:	:
Arizona	:	1,020	:	t	:	+	:	1. :	10 :
Utah	:	1,120	:	:	:	:	:	:	:
Nevada	:	408	:	:	:	t	:	+	3. :
Idaho	:	4,900	:	—	:	—	:	:	21 :
Washington	:	2,630	:	:	:	t	:	+	8. :
Oregon	:	4,450	:	:	:	:	:	:	:
California	:	34,320	:	:	:	.6	:	207	5. :
<hr/>									
United States	:	256,375	:	3.2	:	8,802	:	+	.9 :
	:		:	:	:		:	2,381	+
	:		:	:	:		:	2.	:
	:		:	:	:		:		5,350
	:		:	:	:		:		+
	:		:	:	:		:		:

Total reduction in yield due to stripe and the smuts 6.1 16,533

OAT

Estimated reduction in yield of oats due to smuts (Ustilago avenae
and U. levis), 1918.

State	: Production :		: Estimated reduction in yield due to smut	
	: 1918 :		: :	
	: Bushels :		: Bushels :	
	: 000 omitted :	% :	: 000 omitted :	
Maine	: 6,760	: 2.4 :	: 166	:
New Hampshire	: 912	: 3. :	: 28	:
Vermont	: 4,223	: 2.8 :	: 122	:
Massachusetts	: 480	: 6. :	: 31	:
Rhode Island	: 84	: 6.5 :	: 6	:
Connecticut	: 912	: 2.5 :	: 23	:
New York	: 51,660	: 3.3 :	: 1,763	:
New Jersey	: 3,400	: 2.3 :	: 80	:
Pennsylvania	: 47,190	: 4.5 :	: 2,224	:
	:	:	:	:
Maryland.	: 1,980	: 3.0 :	: 61	:
Virginia	: 5,175	: 5. :	: 272	:
West Virginia	: 4,320	: 1.8 :	: 79	:
North Carolina	: 6,500	: 8.2 :	: 532	:
South Carolina	: 11,000	: 7.0 :	: 828	:
Georgia	: 12,000	: 7.6 :	: 987	:
	:	:	:	:
Ohio	: 79,200	: 7.2 :	: 6,145	:
Indiana	: 85,050	: 3.6 :	: 3,176	:
Illinois	: 193,352	: 6.0 :	: 12,661	:
Michigan	: 66,380	: 6. :	: 4,233	:
Wisconsin	: 110,162	: 3. :	: 3,407	:
Minnesota	: 134,562	: 2.6 :	: 3,592	:
Iowa	: 229,572	: 1.1 :	: 2,553	:
Missouri	: 44,136	: 4.0 :	: 1,841	:
	:	:	:	:
North Dakota	: 60,512	: 4.9 :	: 3,115	:
South Dakota	: 84,240	: 3.2 :	: 2,785	:
Nebraska	: 56,188	: 4.5 :	: 2,648	:
Kansas	: 51,238	: 4.5 :	: 2,414	:
Kentucky	: 9,600	: 5. :	: 505	:
Tennessee	: 8,125	: 5. :	: 428	:
Alabama	: 8,132	: 5. :	: 428	:
Mississippi	: 5,600	: 5. :	: 295	:
Louisiana	: 2,000	: 2.7 :	: 55	:
Texas	: 22,197	: 8.5 :	: 2,062	:
Oklahoma	: 33,120	: 5.6 :	: 1,965	:
Arkansas	: 11,271	: 8.5 :	: 1,047	:
	:	:	:	:
Montana	: 20,400	: 2.0 :	: 416	:
Wyoming	: 11,685	: 2.5 :	: 300	:
Colorado	: 9,669	: 5.8 :	: 535	:
Arizona	: 440	: 2.0 :	: 9	:
Nevada	: 532	: 5. :	: 28	:
Washington	: 8,370	: 3. :	: 259	:
Oregon	: 9,025	: 1. :	: 91	:
California.	: 5,600	: 1.6 :	: 91	:
Other states	: 16,405	:	:	:
	:	:	:	:
United States	: 1,538,359	: 4.2 :	: 64,396	:
	:	:	:	:

Estimated reduction in yield of corn due to smut (*Ustilago zeae*), leaf rust (*Puccinia sorghi*), brown spot (*Physoderma zeae-maydis*) and root and ear rots (*Fusarium* sp.), 1918.

State	Estimated reduction in yield due to diseases									
	Production : : 1918 : Bushels : :000 omitted	Smut : : Bushels : :000 omitted	Leaf rust : : Bushels : :000 omitted	Brown Spot : : (Physoderma) : Bushels : :000 omitted	Root and ear rot : : Bushels : :000 omitted	%	%	%	%	%
Maine	1,215	+	0	0	-	-	-	-	-	-
New Hampshire	1,260	-	0	0	-	-	-	-	-	-
Vermont	1,710	-	0	0	-	-	-	-	-	-
Massachusetts	2,080	10	+	0	+	t	t	t	t	+
Rhode Island	572	-	+	0	-	-	-	-	-	-
Connecticut	2,800	3	+	0	1.	1.	1.	1.	1.	28
New York	29,520	298	+	0	.4	.4	.4	.4	.4	119
New Jersey	11,439	115	+	0	2.	2.	2.	2.	2.	233
Pennsylvania	62,400	1,930	+	0	18.	18.	18.	18.	18.	13,697
Delaware	7,285	-	0	0	-	-	-	-	-	-
Maryland	24,010	243	+	+	t	t	t	t	t	+
Virginia	56,000	566	0	+	2.	2.	2.	2.	2.	1,143
West Virginia	24,800	1,033	0	0	2.	2.	2.	2.	2.	506
North Carolina	64,365	1,991	-	650	1.	1.	1.	1.	1.	650
South Carolina	38,250	781	-	1,594	2.	2.	2.	2.	2.	781
Georgia	68,850	3,624	.6	2,129	4.	4.	4.	4.	4.	2,869
Florida	14,080	-	t	+	-	-	-	-	-	-
Ohio	133,200	4,120	0	+	4.	4.	4.	4.	4.	5,550
Indiana	169,554	-	-	-	3.	3.	3.	3.	3.	5,244
Illinois	351,450	5,352	-	+	3.	3.	3.	3.	3.	10,870
Michigan	48,300	488	0	0	t	t	t	t	t	+
Wisconsin	69,538	349	0	0	1.	1.	1.	1.	1.	792
Minnesota	110,000	553	.2	0	1.	1.	1.	1.	1.	1,111
Iowa	375,624	9,671	.3	1,130	.5	.5	.5	.5	.5	1,888
Missouri	133,860	1,352	.2	268	1.	1.	1.	1.	1.	1,352

North Dakota	9,196	: 1.5 :	140	-	t	+	1.	93
South Dakota	100,183	: 5. :	5,694	-	: 0 :	0	: 2. :	2,208
Nebraska	123,086	: 5. :	6,478	0	: 0 :	0	: 2. :	2,492
Kansas	43,523	: 8. :	3,785	-	: 0 :	0	: 2. :	888
Kentucky	93,600	: 1.5 :	1,425	.4	: t :	+	: 8. :	8,139
Tennessee	84,000	: 7. :	6,323	.8	: 1.5 :	1,279	: 8. :	7,304
Alabama	67,686	: 2.5 :	1,730	0	: .5 :	340	: - :	-
Mississippi	66,300	: .5 :	333	-	: 1. :	670	: 4. :	2,762
Louisiana	29,600	: 1.5 :	451	915	: .5 :	149	: 2. :	604
Texas	69,000	: 8. :	6,000	+	: t :	+	: 5. :	3,632
Oklahoma	24,375	: 4. :	1,016	+	: t :	+	: 5. :	1,283
Arkansas	35,100	: .2 :	70	+	: t :	+	: 2. :	716
Montana	2,100	: t :	+	0	: 0 :	0	: 0 :	0
Wyoming	1,000	: t :	+	0	: 0 :	0	: - :	-
Colorado	11,067	: 30. :	4,743	0	: 0 :	0	: - :	-
New Mexico	4,250	: 5. :	224	-	: 0 :	0	: - :	-
Arizona	952	: 2. :	19	-	: 0 :	0	: - :	-
Utah	672	: t :	+	-	: 0 :	0	: - :	-
Nevada	64	: t :	+	-	: 0 :	0	: - :	-
Idaho	920	: t :	+	-	: 0 :	0	: - :	-
Washington	1,634	: t :	+	0	: 0 :	0	: 0 :	0
Oregon	1,364	: t :	+	0	: 0 :	0	: - :	-
California	2,975	: t :	+	-	: 0 :	0	: - :	-
United States	2,582,814	: 2.6 :	70,876	.1	: .3 :	6,811	: 2.8 :	76,864

Estimated total loss due to above diseases

5.8 158,533

Estimated reduction in yield of potatoes due to late blight (*Phytophthora infestans*), Rhizoctonia, black leg (*Bacillus atrosepticus*), Fusarium wilt (*Fusarium oxysporum*), early blight (*Macrosporium solani*), 1918.

State	Estimated reduction in yield due to diseases									
	Production:		Late blight		Rhizoctonia		Black leg		Fusarium wilt	
	Bushels	%	Bushels	%	Bushels	%	Bushels	%	Bushels	%
	:000 omitted:	:000 omitted:	:000 omitted:	:000 omitted:	:000 omitted:	:000 omitted:	:000 omitted:	:000 omitted:	:000 omitted:	:000 omitted:
Maine	22,400	:15:	3,953	:4:	-	:0:	90	:0:	0	:0:
New Hampshire	2,940	:10:	327	t:	-	:0:	+	:0:	0	:5:
Vermont	3,380	:10:	376	:1:	34	:0:	+	:0:	0	:5:
Massachusetts	4,788	:3:	148	:2:	-	:t:	10	:t:	+	:1:
Rhode Island	650	:2:	13	:t:	-	:t:	+	:t:	+	:1:
Connecticut	2,470	:1:	25	:3:	+	:t:	7	:t:	+	:t:
New York	34,960	:1:	353	:5:	1,840	:1:	+	:1:	353	:t:
New Jersey	8,464	:1:	85	:3:	262	:t:	+	:t:	43	:10:
Pennsylvania	24,400	:2:	498	:5:	1,284	:6:	123	:5:	1,558	:7:
Delaware	957	:1:	10	:t:	-	:t:	+	:t:	-	:4:
Maryland	4,000	:t:	+	:2:	82	:t:	+	:1:	40	:5:
Virginia	11,750	:t:	+	:t:	-	:t:	+	:t:	-	:t:
West Virginia	5,220	:3:	161	:t:	-	:5:	26	:2:	107	:1:
North Carolina	4,275	:t:	+	:t:	-	:t:	-	:t:	+	:t:
South Carolina	2,856	:t:	+	:3:	88	:t:	-	:t:	+	:1:
Georgia	1,610	:1:	16	:t:	-	:t:	+	:0:	0	:10:
Florida	3,500	:5:	184	:t:	+	:t:	-	:0:	0	:t:
Ohio	11,040	:0:	0	:t:	-	:3:	-	:3:	341	:t:
Indiana	7,760	:0:	0	:t:	-	:5:	-	:5:	408	:t:
Illinois	11,520	:0:	0	:t:	-	:5:	-	:5:	606	:t:
Michigan	28,560	:0:	0	:4:	1,190	:1:	29	:5:	1,503	:t:
Wisconsin	33,040	:t:	+	:3:	1,022	:5:	166	:t:	+	:1:
Minnesota	32,760	:3:	99	:2:	669	:3:	1,013	:1.5:	499	:1:
Iowa	9,648	:1:	97	:t:	-	:t:	-	:1:	97	:t:
Missouri	6,954	:0:	0	:t:	+	:t:	+	:1.5:	106	:t:

North Dakota	8,910	0	0	371	2	182	5	469	1	9
South Dakota	8,190	0	0	-	t	+	5	431	-	-
Nebraska	10,406	0	0	212	t	+	4	434	0	0
Kansas	4,240	0	0	223	t	+	.5	21	t	+
Kentucky	5,625	0	0	-	0	0	2	115	1	57
Tennessee	3,500	0	0	-	-	-	1	35	8	304
Alabama	4,800	t	t	0	0	0	t	+	0	0
Mississippi	1,600	t	t	-	-	-	t	+	0	-
Louisiana	4,345	t	t	+	0	0	0	0	4	181
Texas	3,300	0	0	33	-	-	5	174	1	33
Oklahoma	1,258	0	0	-	-	-	1	13	.5	6
Arkansas	2,400	50	2,400	+	-	-	2	49	t	+
Montana	7,020	0	0	71	3	217	1	71	0	0
Wyoming	4,500	0	0	237	-	-	3	139	t	-
Colorado	11,376	0	0	292	-	-	6	726	t	+
New Mexico	1,000	0	0	-	-	-	10	111	t	-
Arizona	425	0	0	22	-	22	10	47	t	+
Utah	3,600	0	0	-	-	-	15	635	0	-
Nevada	1,539	0	0	31	-	-	10	171	0	-
Idaho	5,220	0	0	-	-	-	15	921	0	-
Washington	8,560	t	+	1,514	.3	26	.3	26	0	0
Oregon	5,500	0	0	611	2	112	.3	17	t	+
California	12,870	0	0	263	-	-	6	871	2	263
United States	400,106	1.8	8,745+	10,351+	.4	2,001+	2.3	11,087+	1.07	5,147+

POTATO (continued)

Estimated reduction in yield of potatoes due to mosaic, leaf roll, Verticillium wilt
(Verticillium albo-atrum) and tip burn, 1918.

State	Estimated reduction in yield due to diseases									
	Production : 1918 Bushels :000 omitted	Mosaic : % :000 omitted	Leaf roll : Bushels :000 omitted	Verticillium wilt : Bushels :000 omitted	Tip burn : Bushels :000 omitted					
Maine	22,400	10. : 2,489	t : +	t : +	0 : 0					
New Hampshire	2,940	15. : 519	- : -	- : -	t : +					
Vermont	3,380	15. : 596	- : -	- : -	t : +					
Massachusetts	4,788	8. : 416	1. : 48	t : +	4. : 199					
Rhode Island	650	2. : 13	- : -	- : -	3. : 20					
Connecticut	2,470	1. : 25	.3 : 7	- : -	2. : 50					
New York	34,960	4.5 : 1,647	4. : 1,457	t : +	1. : 353					
New Jersey	8,464	10. : 940	8. : 736	0 : 0	20. : 2,116					
Pennsylvania	24,400	5. : 1,284	10. : 2,711	0 : 0	15. : 4,306					
Delaware	957	t : -	- : -	0 : 0	15. : 169					
Maryland	4,000	t : +	- : -	0 : 0	8. : 348					
Virginia	11,750	t : +	- : -	0 : 0	t : +					
West Virginia	5,220	t : +	- : -	0 : 0	10. : 580					
North Carolina	4,275	5. : 21	- : -	0 : 0	t : +					
South Carolina	2,856	1. : 29	- : -	0 : 0	t : +					
Georgia	1,610	1. : 16	t : +	0 : 0	t : +					
Florida	3,500	2. : 71	- : -	0 : 0	0 : 0					
Ohio	11,040	1. : 112	- : -	- : -	5. : 581					
Indiana	7,760	t : +	- : -	0 : 0	5. : +					
Illinois	11,520	t : +	- : -	0 : 0	5. : 606					
Michigan	28,560	1. : 288	t : +	- : -	20. : 7,140					
Wisconsin	33,040	t : +	t : +	t : 331	8. : 2,873					
Minnesota	32,760	t : +	1. : -	- : -	2. : 669					
Iowa	9,648	t : +	- : -	0 : 0	.3 : 19					
Missouri	6,954	t : +	- : -	0 : 0	2. : 142					

Estimated reduction in yield of dry edible and snap beans due to anthracnose (*Colletotrichum lindemuthianum*), bacterial blight (*Bacterium phaseoli*) and mosaic, 1918.

State	Estimated reduction in yield due to diseases									
	Production: 1918	Anthracnose		Bacterial blight		Mosaic		Root rots		Other diseases
	Bushels :000 omitted:	Bushels :000 omitted:	%	Bushels :000 omitted:	%	Bushels :000 omitted:	%	Bushels :000 omitted:	%	Bushels :000 omitted:
Maine	330*	72	t		t					
New Hampshire	100*	11	1.	1	-	-	-	-	-	
Vermont	100*	14	t	+	t	+	-	-	-	
Massachusetts	12*	+	2.	+	2.	+	t	+	1.	+
Rhode Island		+	1.	+	-	-	-	-	-	
Connecticut		+	.3	+	t	+	-	-	-	
New York	1,660	17	7.	125	15.	293	8.	144	0.	0
New Jersey	23*	+	.5	+	8.	2	-	0	2	
Pennsylvania	54*	4	6.	3	15.	10	3.		7.5	4
Maryland	63*	1	1.5	+	t	+	t	+	t	+
Virginia		+	5.		t	+	t	+	10.	+
West Virginia	144*	9	1.	1	t	+	t	+	2.	3
South Carolina		+	2.	+	-	-	-	+	2.	+
Georgia	44*	+	1.	+	0	0	t	+	-	
Florida		+	t	+	-	-	-	+	-	
Ohio	87*	5	-	-	-	-	-	+	-	
Indiana	35*		-	-	t	+	-	-	-	
Illinois			-	-	-	-	-	-	-	
Michigan	4,887	+	2.	100	2.	100	0	0	t	+
Wisconsin	133	1	1.5	2	t	+	t	+	-	
Minnesota	10*	1	4.	+	-	-	-	+	-	
Iowa	42*		-	-	-	-	-	-	-	
Missouri	87*	+	0	0	-	-	-	-	-	
North Dakota		+	4.	+	-	-	-	+	-	
South Dakota		+	-	-	t	+	t	+	-	
Nebraska	107*	+	t	+	0	0	t	+	-	
Kansas		+	.5	+	1.	+	-	-	0	
Kentucky	132*	3	-	-	t	+	-	-	-	

Mississippi	16,472	3.	509	12.	2,246	-	-	-	-	257
Louisiana	600	0	0	15.	106	0	0	30.	+	+
Texas	63,467	1.	641	30.	27,200	2.	1,295	t	+	+
Oklahoma	276	.3	1	5.	15	0	0	t	0	0
Arkansas	5,725	t	+	5.	301	1.	58	0	0	0
Colorado	11,499	1.	116	-	-	t	+	0	+	+
New Mexico	1,492	t	+	-	-	-	-	+	-	-
Utah	12,317	-	0	-	-	0	0	0	0	0
Washington	77	0	0	-	-	0	0	0	0	0
Oregon	985	-	-	-	-	0	0	0	0	0
California	253,161	-	-	-	-	5.	13,324	-	-	-
United States	1,702,555	18.2	456,304	4.6	115,379+	.8	19,607+	1.7	41,740+	30.

Estimated total reduction due to above diseases

30. 801,763+

SWEET POTATO

Estimated reduction in yield of sweet potatoes due to stem rot (*Fusarium hyperoxysporum* and *F. batatis*), foot rot (*Plenodomus destruens*), black rot (*Sphaeronea fimbriatum*), soil rot (*Cystospora batata*) and storage rots caused by various organisms, 1918.

State	Estimated reduction in yield due to diseases									
	Production : 1918 Bushels :000 omitted	Stem rot : Bushels :000 omitted	Foot rot : Bushels :000 omitted	Black rot : Bushels :000 omitted	Storage rot : Bushels :000 omitted	Soil rot : Bushels :000 omitted	%	%	%	%
New Jersey	2,875	631	+	151	958	15	18.	5.	25.	5.
Pennsylvania	120	-	0	1	-	-	-	1.	-	-
Delaware	600	150	0	25	200	12	20.	4.	25.	2.
Maryland	1,430	158	15	60	159	+	10.	4.	10.	t
Virginia	3,360	292	69	69	2,240	17	8.	2.	40.	5.
West Virginia	212	-	0	-	-	-	-	-	-	-
North Carolina	8,910	182	0	469	5,940	-	2.	5.	40.	-
South Carolina	7,600	155	0	572	5,066	-	2.	7.	40.	-
Georgia	11,960	-	0	1,329	5,126	-	-	10.	30.	-
Florida	3,960	-	+	81	-	-	t	2.	-	-
Ohio	96	4	2	-	-	-	4.	-	-	-
Indiana	324	-	0	-	-	-	-	-	-	-
Illinois	656	13	0	-	-	-	2.	-	-	-
Iowa	279	15	9	-	-	-	5.	-	-	-
Missouri	728	-	4	-	-	-	-	-	-	-
Kansas	320	20	+	10	80	+	6.	3.	20.	+
Kentucky	1,235	+	0	13	412	-	t	1.	25.	-
Tennessee	2,940	30	0	327	980	-	1.	10.	25.	-
Alabama	14,688	148	0	454	7,909	-	1.	3.	35.	-
Mississippi	8,455	-	0	262	4,553	-	-	3.	35.	-
Louisiana	4,875	-	0	151	2,089	-	t	3.	30.	-
Texas	5,046	51	0	439	2,163	+	1.	8.	30.	+
Oklahoma	975	20	0	30	418	-	2.	3.	30.	-

Arkansas	3,420	2.	70	0	2.	70	35.	1,842	+	+
New Mexico	250	-	-	0	2.	5				
California	1,020	3.	30	10	2.	21	25.	340		
United States	86,334	1.5	1,969+	109+	3.4	4,539	30.3	40,475	.03	44+

Total reduction in yield from above diseases

35.3 47,136+

Estimated reduction in yield of lint cotton due to anthracnose (*Colletotrichum gossypii*), angular leaf spot (*Bacterium malvacearum*), wilt (*Fusarium vasinfectum*), root-knot (*Heterodera radicicola*), and potash hunger (non-parasitic), 1918.

State	Production : 1918 Bales :000 omitted	Estimated reduction in yield due to diseases									
		Anthracnose	Angular leaf spot	Wilt	Root knot	Potash hunger					
		% :000 omitted	% :000 omitted	% :000 omitted	% :000 omitted	% :000 omitted	%	%	%	%	%
Virginia	26	1.	-	-	-	-					
North Carolina	870	2.	-	-	-	-					
South Carolina	1,500	1.	18	3.	27	10.					97
Georgia	2,100	8.	15	2.	31	20.					375
Florida	25	7.	183	8.	183	15.					371
Missouri	70	-	2	1.	-						
Tennessee	330	3.	10	1.5	5						
Alabama	820	5.	4	7.	62	10.					91
Mississippi	1,210	1.	12	5.	64	8.					105
Louisiana	525	1.5	8	5.	28						-
Texas	2,580	1.5	39	1.5	39						-
Oklahoma	550	-	-	3.	11						-
Arkansas	935	-	-	5.	29	4.					39
Arizona	51	-	-								
California	100		2.	1							
Other states	8										
United States	11,700	2.1	291	9.	133	3.5	479	1.3	179	7.8	1,078

Total reduction in yield from above diseases

15.6 2,160

Estimated reduction in yield of onions due to smut
(*Urocystis cepulae*) and other diseases.

State	Production		Estimated reduction in yield due to diseases			
	1918					
	Bushels		Smut		Other diseases	
	:000 omitted		Bushels		Bushels	
	%		:000 omitted		%	
Massachusetts	2,185	2.	45	3.	68	
New York	3,570	15.	630	1.	36	
New Jersey	640					
Pennsylvania	56	2.	1	2.	1	
Ohio	1,887	3.	58	-	-	
Indiana	1,067					
Michigan	496					
Wisconsin	343					
Minnesota	561					
Iowa	360					
Kentucky	255					
Louisiana	135	-	-	20.	34	
Texas	2,912	-	-	30.	1,248	
Colorado	329					
Utah	51					
Idaho	17					
Washington	421			.5	2	
Oregon	176	10.	20	-	-	
California	3,358	-	-	10.	373	
United States	18,819	3.5	754	8.3	1,762	

Total reduction due to diseases

11.8

2,516 bushels

PEACH

Estimated reduction in yield of peaches due to leaf curl (Exoascus deformans), brown rot (Sclerotinia cinerea), and other diseases including scab, yellows and Coryneum blight.

State	: Production : Estimated reduction in yield due to diseases :							
	: 1918 :							
	: Bushels : Leaf curl : Brown rot : Other diseases :							
	:000 omitted :	: Bushels :	: Bushels :	: Bushels :	: Bushels :	: Bushels :	: Bushels :	: Bushels :
	: % :	:000 omitted: % :	:000 omitted: % :	:000 omitted: % :	:000 omitted: % :	:000 omitted: % :	:000 omitted: % :	:000 omitted: % :
Massachusetts	: 9 :	: t : + :	: t : + :	: t : + :	: t : + :	: t : + :	: t : + :	: t : + :
Rhode Island	: 2 :	: t : + :	: t : + :	: t : + :	: t : + :	: t : + :	: t : + :	: t : + :
Connecticut	: 15 :	: t : + :	: t : + :	: t : + :	: t : + :	: t : + :	: t : + :	: t : + :
New York	: 1,167 :	: t : + :	: 12 : 5 :	: 12 : 5 :	: 12 : 5 :	: 12 : 5 :	: 12 : 5 :	: 12 : 5 :
New Jersey	: 792 :	: t : + :	: 42 : 8 :	: 42 : 8 :	: 42 : 8 :	: 42 : 8 :	: 42 : 8 :	: 42 : 8 :
Pennsylvania	: 1,210 :	: 1.5: 18 :	: 15: 213 :	: 15: 213 :	: 15: 213 :	: 15: 213 :	: 15: 213 :	: 15: 213 :
Delaware	: 284 :	: 2. : 6 :	: 10: 32 :	: 10: 32 :	: 10: 32 :	: 10: 32 :	: 10: 32 :	: 10: 32 :
Maryland	: 600 :	: 1.5: 9 :	: 8: 52 :	: 8: 52 :	: 8: 52 :	: 8: 52 :	: 8: 52 :	: 8: 52 :
Virginia	: 578 :	: 2. : 12 :	: 8: 50 :	: 8: 50 :	: 8: 50 :	: 8: 50 :	: 8: 50 :	: 8: 50 :
West Virginia	: 850 :	: 2. : 17 :	: t : + :	: t : + :	: t : + :	: t : + :	: t : + :	: t : + :
North Carolina	: 1,035 :	: 1.5: 16 :	: 10: 115 :	: 10: 115 :	: 10: 115 :	: 10: 115 :	: 10: 115 :	: 10: 115 :
South Carolina	: 1,064 :	: 1.5: 16 :	: 10: 118 :	: 10: 118 :	: 10: 118 :	: 10: 118 :	: 10: 118 :	: 10: 118 :
Georgia	: 6,746 :	: 1. : 68 :	: 10: 750 :	: 10: 750 :	: 10: 750 :	: 10: 750 :	: 10: 750 :	: 10: 750 :
Florida	: 264 :	: 0 : 0 :	: t : + :	: t : + :	: t : + :	: t : + :	: t : + :	: t : + :
Ohio	: 348 :	: t : + :	: 2. : 7 :	: 2. : 7 :	: 2. : 7 :	: 2. : 7 :	: 2. : 7 :	: 2. : 7 :
Indiana	: 72 :	: t : + :	: 0 : 0 :	: 0 : 0 :	: 0 : 0 :	: 0 : 0 :	: 0 : 0 :	: 0 : 0 :
Illinois	: 78 :	: 0 : 0 :	: 0 : 0 :	: 0 : 0 :	: 0 : 0 :	: 0 : 0 :	: 0 : 0 :	: 0 : 0 :
Michigan	: 248 :	: t : + :	: t : + :	: t : + :	: t : + :	: t : + :	: t : + :	: t : + :
Kentucky	: 110 :	: t : + :	: t : + :	: t : + :	: t : + :	: t : + :	: t : + :	: t : + :
Tennessee	: 840 :	: t : + :	: t : + :	: t : + :	: t : + :	: t : + :	: t : + :	: t : + :
Alabama	: 3,142 :	: 0 : 0 :	: 10: 349 :	: 10: 349 :	: 10: 349 :	: 10: 349 :	: 10: 349 :	: 10: 349 :
Mississippi	: 1,386 :	: t : + :	: 10: 154 :	: 10: 154 :	: 10: 154 :	: 10: 154 :	: 10: 154 :	: 10: 154 :
Louisiana	: 615 :	: 0 : 0 :	: 10: 68 :	: 10: 68 :	: 10: 68 :	: 10: 68 :	: 10: 68 :	: 10: 68 :
Texas	: 2,041 :	: 0 : 0 :	: 2. : 42 :	: 2. : 42 :	: 2. : 42 :	: 2. : 42 :	: 2. : 42 :	: 2. : 42 :
Oklahoma	: 303 :	: t : + :	: 1. : 3 :	: 1. : 3 :	: 1. : 3 :	: 1. : 3 :	: 1. : 3 :	: 1. : 3 :
Arkansas	: 260 :	: t : + :	: 2. : 5 :	: 2. : 5 :	: 2. : 5 :	: 2. : 5 :	: 2. : 5 :	: 2. : 5 :
Colorado	: 754 :	: 0 : 0 :	: 0 : 0 :	: 0 : 0 :	: 0 : 0 :	: 0 : 0 :	: 0 : 0 :	: 0 : 0 :
New Mexico	: 85 :	: 0 : 0 :	: 0 : 0 :	: 0 : 0 :	: 0 : 0 :	: 0 : 0 :	: 0 : 0 :	: 0 : 0 :
Arizona	: 58 :	: 0 : 0 :	: 0 : 0 :	: 0 : 0 :	: 0 : 0 :	: 0 : 0 :	: 0 : 0 :	: 0 : 0 :
Utah	: 1,080 :	: — : — :	: — : — :	: — : — :	: — : — :	: — : — :	: — : — :	: — : — :
Nevada	: 15 :	: 0 : 0 :	: — : — :	: — : — :	: — : — :	: — : — :	: — : — :	: — : — :
Idaho	: 80 :	: 0 : 0 :	: — : — :	: — : — :	: — : — :	: — : — :	: — : — :	: — : — :
Washington	: 1,130 :	: t : + :	: — : — :	: — : — :	: — : — :	: — : — :	: — : — :	: — : — :
Oregon	: 118 :	: t : + :	: t : + :	: t : + :	: t : + :	: t : + :	: t : + :	: t : + :
California	: 11,570 :	: t : + :	: — : — :	: — : — :	: — : — :	: — : — :	: — : — :	: — : — :
United States	: 38,960 :	: .4: 162+ :	: 4.7: 2,012+ :	: 4.7: 2,012+ :	: 4.7: 2,012+ :	: 4.7: 2,012+ :	: 4.7: 2,012+ :	: 4.7: 2,012+ :

Total reduction due to diseases

8.6

3,664+

٤١٢

Production:	Estimated reduction in yield due to diseases
:	:
:	:

State	Production: 1918	Estimated reduction in yield due to diseases											
		Bitter rot		Black rot		Blotch		Fire blight		Scab		Other diseases	
		Bushels	%	Bushels	%	Bushels	%	Bushels	%	Bushels	%	Bushels	%
		:000 omitted:	:	:000 omitted:	:	:000 omitted:	:	:000 omitted:	:	:000 omitted:	:	:000 omitted:	:
Me.	2,287	0	:	0	:	0	:	0	:	0	:	-	:
N. H.	1,944	0	:	0	:	0	:	0	:	+	:	+	:
Vt.	1,002	0	:	0	:	0	:	0	:	+	:	-	:
Mass.	2,446	+	:	25	:	0	:	0	:	+	:	+	:
R. I.	201	+	:	2	:	0	:	0	:	+	:	-	:
Conn.	1,184	+	:	12	:	0	:	0	:	+	:	-	:
N. Y.	37,253	+	:	+	:	0	:	0	:	+	:	1,961	:
N. J.	2,464	25	:	76	:	12	:	103	:	50	:	76	:
Penn.	17,775	+	:	1,135	:	550	:	1,546	:	1,135	:	741	:
Del.	500	+	:	25	:	+	:	+	:	-	:	26	:
Md.	2,365	+	:	73	:	24	:	73	:	+	:	125	:
Va.	9,000	+	:	+	:	+	:	+	:	184	:	1,000	:
W. Va.	8,174	+	:	+	:	+	:	167	:	+	:	341	:
N. C.	5,460	+	:	+	:	-	:	55	:	-	:	475	:
S. C.	800	89	:	16	:	42	:	33	:	8	:	69	:
Ga.	1,760	196	:	54	:	+	:	112	:	18	:	93	:
Ohio	8,316	+	:	170	:	84	:	-	:	-	:	347	:
Ind.	2,070	+	:	+	:	21	:	-	:	-	:	86	:
Ill.	3,213	0	:	33	:	66	:	49	:	134	:	134	:
Mich.	10,966	0	:	-	:	-	:	-	:	577	:	157	:
Wisc.	2,061	0	:	+	:	0	:	109	:	109	:	86	:
Minn.	792	0	:	8	:	+	:	42	:	4	:	33	:
Iowa	1,620	-	:	-	:	+	:	-	:	50	:	68	:
Mo.	4,245	+	:	131	:	43	:	+	:	87	:	177	:

[illegible]

Total reduction due to diseases:

9.9 19,273.

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THE PLANT DISEASE BULLETIN

Issued By

The Plant Disease Survey

SUPPLEMENT 7

Index to Supplements 1 - 6

August 15, 1919.

BUREAU OF PLANT INDUSTRY

UNITED STATES DEPARTMENT OF AGRICULTURE



INDEX TO SUPPLEMENTS I-VI, PLANT DISEASE BULLETIN

1913

Prepared by Mary G. Van Meter.

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ERRATA AND EXPLANATION

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- 10 Read "Armillaria mellea" instead of "Armillaria mella".
- 18 Apple, "Frog-eye", read "Illosporium" instead of "Illiosporium".
- 20 Quince, "Leaf blight", read "Fabraea" instead of "Fabrea".
- 27 Apple, "Other diseases", read "Clitocybe monadelpha" instead of "Clitocybe monadelphus".
- 29 Read "Coryneum beijerinckii" instead of "Coryneum beijernickii".
- 31 Read "Exoascus cerasi" instead of "Excascus cerasi".
- 70 Read "Rhizoctonia" instead of "Rhozoctonia".
- 82 Read "Aspergillus" instead of "Aspergillis".
- 101 In table substitute "Stem end rot" for "Anthracnose", in both columns.
The melons in the six cars listed as coming from Missouri probably were not grown in that state.
- Read "Nematode caused considerable damage in local fields in Texas and California."
- 111 Read "Marssonina" instead of "Marssoria".
- 115 Pea "Other diseases", read "Thielavia" instead of "Thielvia".
- 129 Read "Ustilago tritici (Pers.) Rostr." instead of "Ustilago tritici (Pers.) Jens.", in heading for loose smut.
- 134 Read "Tylenchus tritici (Stein.) Bast.", instead of "Tylenchus tritici Bauer."
- 139 Read "Urocystis occulta (Wallr.) Rab." instead of "Urocystis occulta (Wallr.) Reb."
- 142 Read "Helminthosporium gramineum Rab." instead of "Helminthosporium gramineum (Rab.) Erik."
- Read "Helminthosporium sativum P. K. & B." instead of "Helminthosporium sativum (Pers.) K. & B."
- 150 Read "Bacterial wilt" instead of "Bacterium wilt."
- 151 Corn, "leaf blight" read "Inconspicuum" instead of "inconspicum".
- Rice, "Other diseases", read "Ustilaginoides virens (Oke.) Tak." instead "Ustilaginoides virens (Oke.)"
- 154 Read "Cercospora medicaginis" instead of "Cercospora medicabinis".

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- 155 Alfalfa, read "Stagonospora" instead of "Stagnospora".
- 156 Clover, substitute "Cuscuta spp." for "Cucuta spp.".
- 170 Read "Botrytis douglasii" instead of "Botrytis douglessi".
- 175 Mountain Ash, read "Cytospora leucostoma" instead of "Cytospora leucostroma".
- Palm, read "Graphiola phoenicis" instead of "Graphiola phoenesis".
- 177 Spruce, read "Coleosporium solidaginis" instead of "Coleosporium solidiganis".
- Tulip tree, read "Rhytisma liriodendri" instead of "Rhytisma lirodendri".
- 178 Willow, read "Rhytisma salicinum" instead of "Rhytisma solicinum".
- 179 Read "Dracaena" instead of "Dracenea".
- Read "Euonymus" instead of "Enonymus".
- 180 Euonymus, read "Exosporium concentricum" instead of "Exosporium concentrichum".
- 181 Ivy, read "Phyllosticta ampelopsidis" instead of "Phyllosticta ampelopidis".
- 182 Rose, read "Leptosphaeria coniothyrium" instead of "Leptosphaeria coniothyrum".
- 183 Vetch, substitute report on page 156 for summary of diseases on this host.
- 190 Wheat, "Scab" for Pennsylvania read "764" instead of "77".
- 205 Tomato, "Early blight", Connecticut, read "1+" instead of "16" bushels.



